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THE DOMESTICATION OF CERTAIN RUMINANTS AND AQUATIC BIRDS.

BY A. E. BROWN AND J. D. CATON.

The following correspondence will interest both naturalists and sportsmen:

ZOÖLOGICAL GARDEN,
PHILADELPHIA, FRIDAY, Nov. 7, 1879.

HON. J. D. CATON.

Dear Sir:—The large amount of information which I have gained from your valuable work on the Antelope and Deer of North America, together with your well known interest in all matters relating to the domestication of the Cervidæ, leave me little hesitation in taking up a small portion of your time on the subject. My experience with our mule deer (*C. macrotis*) has been very similar to yours, with the exception that the adults, two bucks and one doe, which were first procured by the Society four years ago, have all done well and are now in very excellent condition. In the summer of 1878, we bred two fawns, and during the past summer three more, two of these being twins, one of which died when two days old. The other four turned out just as yours have done; all were subject to diarrhœa, which was checked by the use of astringent food, as oak leaves and ragweed, to avoid as much as possible the giving of medicines, but in every case the disease returned. This summer I have regularly plied them with tonics, first iron water, from a spring near the garden, then sulphate of quinia, and finally gentian powders, with good effect for a while but without affecting the general result. In each case I have found on post mortem examination, a similar condition of things—the diarrhœa resulted from cancer of the stomach (except in the youngest,

some four months old, in which there was peritonitis, but no localized center of irritation); the general physical condition was poor, tubercles generally being found in the liver and spleen; in each case death was immediately owing to the presence of a fibrous clot in the heart, resulting from the generally impoverished condition of the animal. All had fed well or rather voraciously up to the day of death.

The females have never appeared to take much care of the young, and they have been weaned very early. I have about determined, if I have an opportunity to try again, to attempt to raise the young altogether by hand. This is, of course, always risky, but from past experience I am inclined to think it no more so than to leave them with the mother. It is very difficult to give them the proper amount of arboreal food, and its place has to be supplied mostly with ordinary dry food and grass, hay, a little corn, bran several times a week, either wet or dry as may seem to be desirable for the condition of the animal. I have not noticed in any of our specimens, the elongation of the hoof which you observed in yours. I will be exceedingly glad if you can give me any ideas or suggestions which would serve to promote my attempts to domesticate the species—as thus far I confess to a complete failure—the breeding of healthy offspring being the best possible measure of success in domestication.

It will not be uninteresting to you to know what my experience has been with other species of deer. We have had in the collection the following:

Moose (*Alce americanus*).
Caribou (*Rangifer caribou*).
Wapiti (*Cervus canadensis*).
Common deer (*C. virginianus*).
White-tailed deer (*C. leucurus*).
Mule deer (*C. macrotis*).
Mazame deer (*C. campestris*).
Wood Brocket (*C. nemorivagus*). } South America.
Pudu deer (*C. pudu*).
Fallow deer (*Cervus dama*). Europe.
Axis deer (*C. axis*).
Sambur deer (*C. aristotelis*). } India.

All of five specimens of moose and eight of caribou have died at periods varying from three months to two years and five months,

in the moose, and not beyond nine months in the caribou, from hypertrophy of the heart; owing, in my opinion, in great measure to the impossibility of providing the proper kind and quality of arboreal food, and somewhat also to the climate and the limited range given them in a zoölogical garden. *C. canadensis* and *C. virginianus* have done well. We have bred a number of each and have lost none from natural causes, except some four or five fawns from improper care when first born. Of *C. leucurus* we have had but one specimen. The South American deer seem to be constitutionally weak. We have bred and raised several of *C. campestris*, as also of *C. aristotelis* and *C. dama*. In *C. axis* the female has had two abortions, and is now, I think, too old to breed. My experience with our prong-horn *(A. americana)* has also been similar to yours—they all die speedily from diarrhœa or hypertrophy of the heart; change of food and tonics seem to have no effect upon them. We have had some ten or twelve individuals, none of which lived more than fifteen months.

The only possible apology for so long a letter is the great interest of the subject, which I trust you will accept as sufficient to warrant the liberty, and I shall be glad to consider myself as under obligation for any result of your experience in the domestication of the mule deer, which you are at liberty to assist me with. I am, with much respect, your obedient servant,

ARTHUR E. BROWN.

I have just been much disappointed in losing a fawn of the Javan musk deer or Chevrotain *(Tragulus javanicus)*. The mother refused from the start to take any care of it, and I succeeded in keeping it alive for three days, by hand, but it was too delicate to stand handling and has just died. The little thing weighed less than three ounces, the adults being only about ten inches high.—*A. E. B.*

OTTAWA, ILLINOIS, November 10th, 1879.

ARTHUR E. BROWN, ESQ., Gen'l Supt. Zoö. Soc. Philadelphia:

Dear Sir:—I am just in receipt of your very kind and interesting letter of the 7th inst., and hasten to reply and thank you.

I have received no more mule deer since my book was published, and about that time I lost my last of that species and also of the Columbia deer (*C. columbianus*), I am satisfied that they cannot be successfully domesticated in my grounds. They either find something which does not agree with them or something is want-

ing which they require—most probably the former. And hence I think that closer confinement will promise better results.

I added seven more antelope (*Antilocapra americana*) to my grounds, but all died in the course of the summer. Indeed all my experiments with ruminants, *fera naturæ*, whose natural habitation is confined to the United States, west of the Missouri river, have proved failures.

About two years since I received a mountain sheep (*Ovis montanus*)—a female, from General Miles, stationed at Fort Keogh, and in the spring following another (a young male), but in spite of every possible care, both have died with much the same complaints as the mule and Columbia deer. In less than a month after arrival diarrhœa set in and though arrested repeatedly it would always return. The male survived scarcely six months, the female nearly two years, but she grew but little and scarcely ever seemed well.

My Virginia deer continue to reduce in numbers till now I have not more than fifteen, though these seem to be vigorous and perfectly healthy, yet not prolific. I have turned my attention to hybridizing them with the Ceylon deer and the Acapulco deer (*C. acapulcensis*), which with the hybrids seem to be perfectly healthy and prolific. I think it remarkable that these small species of deer, from such great distances and warm countries, should be so hardy and prolific here—most of the thorough-bred does have had two fawns this year, and several of the hybrids to this buck brought from Acapulco have two fawns and all perfectly healthy. I consider these small deer a great acquisition. On some of the hybrids the metatarsal gland is wanting and on some it is present, while some will have it on one hind leg and not on the other.

My elk (*C. canadensis*), continue to do well and are so prolific that I have had repeatedly to reduce their number, and would be glad now to dispose of at least thirty. I have on an average about one old buck a year killed in battle, and sometimes another by some casualty, but all are healthy. Mine grow very large, and of all the Cervidæ they seem best adapted to domestication.

You mention among your other species of deer *Cervus leucurus*. After much study, I came to the conclusion that the *C. leucurus* was but a variety of *C. virginianus* and so stated in my work.

My efforts to acclimatize ornithological specimens have been interesting. The Canada goose (*Bernicla canadensis*), are very

easily domesticated. When taken adult, a month or two is sufficient to make them as tame as those that have been in the grounds for years. They are healthy and prolific.

The white fronted geese (*Anser cærulescens*) do not domesticate so readily, and have not reproduced, though they were observed to couple last spring.

The Hawaiian geese (*Bernicla sandvicensis*), which I brought over in the spring of 1878, have proved hardy and I trust will prove reproductive. They were well sheltered and cared for last winter, and came through in good order. Both geese commenced laying in April, one laid three and the other four eggs, but only one showed a disposition to set upon the eggs, and she, after attending to her business faithfully for ten days, tired of it and quit the nest, so they produced no goslings.

In the wild state they lay but two or three eggs, while in domestication they sometimes lay eight or ten.

Mr. Brickwood, Post Master General of the kingdom, who had them in domestication for many years, sometimes raised as many as ten in a brood.

In domestication they seem to have strong attachments and are fond of human society, one gander in particular has become very fond of me, and always greets me cordially, and will *talk* with me in a low, soft plaintive tone so long as I will indulge the humor.

They are less aquatic than the other geese. The foot is not more than half webbed. They take a bath scarcely once a day, and rarely remain in the water long. I once saw one with the tail under water as we see a hen when forced to swim. Their native habitat is the high volcanic mountains in the Island of Hawaii, where they breed among the lava beds, depending upon the pools which they find among the rocks for water, never going down to the sea. They are of strong flight in the wild state, though in domestication they show little disposition to fly. Altogether they are the most interesting water-fowl which I possess, and I hope another year to raise some of them from the only pair I have left. A few weeks ago I lost the other pair by a mink.

I can add little to your observations on Japanese and Chinese geese. The former is twice as large as the latter. These have black legs, while those have yellow. They are very noisy, fairly discounting the Guinea fowls.

I supposed I had a pair of sand-hill cranes (*Grus canadensis*),

till they were seven years old, when both laid eggs and have done so now for three years. They lay two eggs each upon the naked ground without the least appearance of a nest, and far away from the water. Last spring I procured a young male (as I suppose), but no two of the three ever associate together, as far as observed. One of the females sat about ten days upon her eggs last spring and then gave it up. The crows dined on the eggs of the others.

I hope in the future to write more fully my observations on the mountain sheep and the Hawaiian geese, both of which are interesting subjects of study and are not very thoroughly understood. Very truly yours, J. D. CATON.

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THE CRITICS OF EVOLUTION.

BY J. S. LIPPINCOTT.

[*Continued.*]

Opposition of Dawson.—Prof. Dawson is also an inconsistent writer. In 1869 he published his "Modern Ideas of Derivation," an address to the students of McGill College, Montreal, in which he stated his belief, that Prof. Cope's hypothesis, as advanced in his "Origin of Genera," is the "most promising of all that have been announced," and as "holding forth the most promising line of investigation by which we may hope ultimately to arrive at more true expression of the law of creation with reference to organized beings." This was an admission that he was in accord with the evolutionists.

Prof. Dawson is among those who have attempted to harmonize Scripture and science. I am unable to see that they can at present be harmonized, and am confirmed in the belief in the difficulty, by the opinion of the ablest geologists with whom I have the good fortune to be acquainted. Moreover, Prof. LeConte, of the University of California, confirms this impression. He also has written and lectured largely upon this subject, for the benefit of the Young Men's Christian Association, and is a firm believer in the truths of revealed religion. LeConte candidly admits that all attempts to reconcile the Mosaic cosmogony with the results of science must be distasteful to the philosophical Christian. They must ever be but artificial and ingenious human devices. Far better to regard the books of Revelation and of

nature in the philosophical spirit, and simply to wait and possess yourselves in patience, for the questions in dispute will, ere long, adjust themselves as others have done. He has used them, he admits, in times past, "but now considers them almost like trifling with the words of Scripture and the teachings of nature."[1]

"He who believes the Scriptures to have proceeded from Him who is the Author of nature, may well expect to find the same sort of difficulties in them as are found in the constitution of nature." This passage is from the writings of Origen, "the father of biblical criticism and exegesis in Christendom," and is probably the text upon which Bishop Butler based his "Analogy of Religion, Natural and Revealed, to the constitution and course of Nature," "the ablest treatise on the philosophy of religion."

Prof. Dawson admits that "organizations styling themselves 'the Church,' whose warrant from the Bible is often of the slenderest, have denounced and opposed new scientific truths and persecuted their upholders, but they have just as often denounced the Bible itself, and religious doctrines founded on it." He remarks that "theology is not religion, and may often have very little in common with true religion or with the Bible. When discussions arise between theology and other sciences, it is only a pity that either side should indulge in what has been termed the *odium theologicum*, but which is unfortunately not confined to *divines*." "Perhaps," he continues, "the most troublesome opposition to science, or rather to the progress of science, has sprung from the *tenacity with which we hold to old ideas*." The science, which was at one time the best attainable, roots itself in men's minds and thus "becomes a difficult matter to wrench from its hold, and its advocates are too apt to invoke in its defense political, social and ecclesiastical powers, and to support it by the authority of revelation, even when this, rightly understood, might be quite as favorable to the new views."

A work by Prof. Dawson entitled[2] "The Story of the Earth and Man," is, by many, esteemed a forcible protest against evolu-

[1] "Religion and Science; a series of Sunday lectures on the Relation of Natural and Revealed Religion, or the Truths revealed in Nature and Scripture." By Joseph LeConte, Prof. of Geology and Natural History in the University of California. 1874.

[2] "The Story of the Earth and Man." By J. W. Dawson, LL.D., F.R.S, F.G.S. Toronto and Montreal, 1873, p. 339, which has been severely criticised by Dr. Asa Gray in "Darwiniana," pp. 245-251

tion. In it he attempts to explain the facts of nature on the theory of creation as opposed to evolution, while he denounces the advocates of Darwinism, and boldly asserts "that evolution as an hypothesis has no basis in experience or in scientific fact." This work was written in 1873. He has so well described the character of the obstructionist and irreconcilable in the extracts above given from a more recent paper,[1] that we may almost imagine that he had himself in view, and that larger knowledge of the accumulating facts of evolution has had some influence upon his position as respects its scientific basis.

Prof. J. W. Dawson is, I believe, the only naturalist of deserved reputation who repudiates the established truths of evolution; yet he deems it his duty to apologize for the supposed "conflict of science and religion," and in the *Princeton Review* for November, 1879, appeared the following delivery from his pen. The pursuit of science has not entirely failed, even in his case, to widen his mental scope, and render him wiser than his theological proclivities would alone have left him:

"Perhaps there is no part of the Bible in which the teaching of nature with reference to divine things is more fully represented than in the Book of Job, and I am inclined to think that not a few, even of religious men, fail to see precisely the significance of the address of the Almighty to Job, in the concluding chapter of that book. Job is tortured and brought near to death by severe bodily disease. His friends have exhausted all their divinity and philosophy upon him in the vain effort to convince him that he deserves this infliction for special and aggravated sins; at length the Almighty intervenes and gives the final decision. But instead of discussing the ethical and theological difficulties of the case, He enters into a sublime and poetical description of nature. He speaks of the heaven above, of the atmosphere, its vapors, and its storms, and of the habits and powers of animals. In short Job is treated to a lecture on natural history, yet this instantaneously affects what the arguments of his friends have altogether failed to produce, and Job humbles himself before God in contrition and repentance. * * *

"I would put this case of Job before modern Christians in three aspects: (1) Do we attach enough of importance to the Gospel of nature, as vindicating God's sovereignty and fatherhood, and preaching submission, humility and faith? Might we not here take a lesson from the Bible itself? (2) May there not be many in our time who like Job 'have heard of him with the hearing of

[1] "The So-called Conflict of Science and Religion." By Principal J. W. Dawson, of McGill University, in *The Science Monthly*, Vol x, pp. 72, 74.

the ear,' but have not seen him with the eye in his 'works,' and on the other hand, are there not many who have seen the works without seeing the Maker, who can even 'magnify God's works which men behold' without knowing the author of them? Would it not be well to bring more together in friendly discussion and comparison of notes, those who thus look on only one side of the shield? (3) Should we not beware of the error of Job's friends in misrepresenting God's plans and thereby denouncing those who differ from us? These three wise and well-meaning men had nature all around them, yet they disregarded its teachings, and dwelt on old saws and philosophic dogmas, until God himself had to bring out the whirlwind, the thunderstorm, the ostrich, the horse and the hippopotamus to teach a better theology." "What does this import? Simply that through the representation to him of God's works, Job had attained a new view of God and of himself. He had not considered or fairly viewed the world around him in its grandeur, its complexity, its unaccountable relations, and contrasted it with his own little sphere of thought and work."

So to the hitherto untaught, whether layman or divine, who, in ignorance of nature, have so generally "uttered what they understood not," "obscured counsel by words without knowledge," and have misrepresented God's plans, the philosophy of evolution will yet prove to be a revelation of the Divine wisdom.

Adhesion of Dr. McCosh.—The work of Dr. James McCosh, the distinguished professor of logic and mathematics of Queen's College, Belfast, on the "Divine Government, Physical and Moral," has been pronounced of preëminent merit, and even Dr. Charles Hodge, of Princeton, the accuser of Darwinism as rank atheism, asserts "it is generally regarded as one of the first books of the age." Dr. McCosh also wrote, in connection with Dr. Dickie, "Typical Forms and Special Ends in Creation," which is described as "in the modern phases of infidelity, as likely to prove more cogent than Butler and quite as unanswerable."

Dr. McCosh proved so powerful a champion against modern infidelity, so able a vindicator of the truths of revealed religion, that the College at Princeton, New Jersey, invited him to become its Principal. The directors were aware that there was no man among their divines of American theological training, competent to combat the "infidels" and do credit to their institution as a learned and accomplished president. Now what is the testimony of this distinguished teacher? It is that[1] "good may

[1] "Is the Development Hypothesis Sufficient?" by Dr. James McCosh in the *Popular Science Monthly*, Vol. x, pp. 86–100.

arise from showing that when the doctrine of development is properly explained and understood, and kept within its legitimate sphere, there is nothing in it inconsistent with natural or revealed religion." In his comments on Huxley's lectures he admits that[1] "transitional forms are ever casting up," and that "in certain fields we have these transitions already disclosed," that "certain cases indicate a tendency on the part of the reptile to rise to the bird, and of the bird to retain properties of the reptile. *I have ever stood up*," says he, "*for a doctrine of development.*" "I see nothing irreligious in holding that the bird may have been evolved by numerous transitions from the reptile, and the living horse from the old horse of the Eocene formation." "Let us suppose they can also, in rare cases of combination, produce species, religion is not thereby undermined either in its evidences or in its essential doctrine." "God is present in all His works, and acts in all their actings." "For in Him we live and move and have our being." "For we are also His offspring." "This doctrine may be so stated as to make it pantheistic. It is the one grand truth contained in pantheism, giving it all its plausibility, and making it superior to that *bald theism which makes God create the world at first, and then stand by and see it go.*" "This doctrine can be so stated as to free it from all such tendencies on the one side or the other, so as to make God distinct from all His works and yet acting in them. This is, I believe, the philosophical doctrine. It has been held by the greatest thinkers which our world has produced, such as Descartes, Leibnitz, Berkeley, Herschel, Faraday and multitudes of others." In the view of the renowned Jonathan Edwards, "nature is a perpetual creation." Dr. McCosh continues: "God is to be seen not only in creation at first, but in the continuance of all things. He is acknowledged not only in the origination of matter, but in its development, not only in the reptile and the bird, but in the steps by which the one has been derived from the other; not only in the Orohippus, but in the stages by which that animal has risen into the horse so useful to man." "I do believe that these old horse forms were preparations for the horse now living." Finally, we conclude our numerous extracts from the writings of Dr. McCosh, with the following: "Suppose we admit all that Huxley claims on this subject, what then? Have we set aside any doctrine of philosophy or religion?

[1] "Is the Development Hypothesis Sufficient?" by Dr. James McCosh, in the *Popular Science Monthly*, Vol. x, pp. 86–100.

God is still to be seen every where in His works, and rules over all. It appears to me," he adds, "that the whole doctrine of vegetable and animal species needs to be reviewed and readjusted, and religion need not fear for the result. I have been convinced of this ever since I learned, when I was ardently studying botany, that the number of species of plants had risen to two millions. I was sure that all these are works of God, but I was not sure that each was a special creation."[1] Thus it appears that Dr. McCosh, one of the ablest defenders of the Christian faith against the attacks of modern infidelity, is a pronounced evolutionist!

Adhesion of Rev. Charles Kingsley.—If the above from the able and orthodox Dr. McCosh does not suffice to show that the whole line of argument used by some popular anti-evolution critics is fitted only to delude the unwary, I may adduce the testimony of Rev. Charles Kingsley in my defense.

This eloquent divine and naturalist, in his "Westminster Sermons,"[2] and in a paper afterwards read to a meeting of London clergy at Sion College, remarks, "The God who satisfies our conscience ought more or less to satisfy our reason also. To teach that, was Butler's mission [in his 'Analogy of Religion, Natural and Revealed'], and he fulfilled it well. But it is a mission which has to be refulfilled again and again, as human thought changes and human science develops. For if in any age or country the God who seems to be revealed by nature seems also different from the God who is revealed by the then popular religion, then that God and the religion which tells of that God, will gradually cease to be believed in." "For the demands of reason must be, and ought to be, satisfied. And, therefore, when a popular war arises between the reason of any generation and its theology, then it behooves the ministers of religion to inquire, with all humility and godly fear, on whose side lies the fault? Whether the theology which they expound is all that it should be, or whether the reason of those who impugn it is all that it should be?" Kingsley pronouncing it the duty of the naturalist to find out the *how* of things, and of the natural theologian to find out the *why*, continues:

"But if it be said, 'After all there is no why, the doctrine of

[1] "Is the Development Hypothesis Sufficient," by Dr. James McCosh. The *Popular Science Monthly*, Vol. x, pp. 86–100.

[2] Charles Kingsley's "Westminster Sermons," quoted in "Darwiniana," pp. 281, 282.

evolution by doing away with the theory of creation does away with that of final causes,' let us boldly answer, 'Not in the least.' We might accept all that Mr. Darwin, all that Prof. Huxley, &c., have written, and yet preserve our natural theology on the same basis as that on which Butler and Paley left it. That we should have to develop it I do not deny. Let us look rather with calmness and even with hope and good-will on these new theories; they surely mark a tendency towards a more or less scriptural view of nature. Of old it was said of Him without whom nothing is made, 'My Father worketh hitherto, and I work.' Shall we quarrel with science if she should show how these words are true? What, in one word, should we have to say but this, 'We know of old that God was so wise that He could make all things, but behold, He is so much more than even that, that he can make all things make themselves.'"

Kingsley was wise in his generation. He well knew that theologians had always been worsted in their conflicts with science, and he would ward off the injury to religion that invariably follows the defeat of her teachers. Moreover, his acquaintance with natural science gave him an extraordinary advantage over such divines as Dr. Hodge, Herbert Morris, *et id omne genus.* Kingsley knew the force of the position taken by Prof. White, of Cornell University, in his "Warfare of Science," and the truth of which he has incontestably proved in that excellent and pithy work; that "In all modern history, interference with science in the supposed interest of religion, no matter how conscientious such interference may have been, has resulted in the direst evils, both to religion and science, *invariably.* And on the other hand all untrammeled scientific investigation, no matter how dangerous to religion some of its stages may have seemed for the time to be, has *invariably* resulted in the highest good of religion and of science."

Origin of Species.— The opponents of evolution sometimes quote a passage from Huxley, as follows, it is "my clear conviction that *as the evidence now stands,* it is not absolutely proven that a group of animals having all the characteristics exhibited by a species in nature, has ever been originated by selection whether artificial or natural." ("Lay Sermons," p. 295.) They evidently forget Huxley's demonstration of the evolution of the horse. "This demonstration does not admit of a doubt," says an excellent authority. Dr. McCosh, as already quoted, says "I do fully believe that those old horse forms were preparations for the

horse now living."[1] "The evidence is conclusive," says Huxley, "as far as the fact of evolution is concerned, and if it can be proved, as the facts certainly do prove, that a complicated animal like the horse may have arisen by a gradual modification of a lower and less specialized form, there is surely no reason to think that any other animals have risen in a different way. The case is not isolated. Every new investigation into the Tertiary mammalian fauna brings fresh evidence tending to show how the rhinoceros, the pigs, the ruminants, have come about. Similar light is being thrown on the origin of Carnivora, and also in a less degree, on that of all the other groups of animals. * * The accurate information obtained in this department [that is regarding the origin of species], has put the *fact* of evolution beyond a doubt. Formerly the great reproach to the theory was, that no support was lent to it by the geological history of living things; now whatever happens, the fact remains that the *hypothesis is founded on the firm basis of palæontological evidence*."—Huxley. Prof. Cope has shown us the origin of the camel by evolutionary processes with as much clearness and force as that of the horse has been demonstrated: Now the above has quite a different ring from Huxley's early admission!

But says the uninformed and persistent doubter, "We know nothing of the method by which these four-toed horses became three-toed, or the three-toed passed into the two-toed, and finally into the one-toed, as we find them in our day. You have brought no evidence to show that they have had any genealogical relation. There is no evidence in modern time to show that any such changes have taken place." Not so fast, my friend, we may reply. There is abundant evidence to show that changes are taking place of a very striking character, some of which are wonderfully pertinent to the case of the origin of the horse of our day. In the December number of the AMERICAN NATURALIST, p. 801, may be found the following, which should silence all discussion on this subject as final and conclusive.

Prof. Cope, when at the meeting of the California Academy of Sciences, Nov. 3, 1879, "Called attention to a pair of feet of a deer belonging to the academy, which were sent from Mendocino county, Cal. Each of these possessed but *one central toe* and

[1] Is the Development Hypothesis Sufficient? By Dr. James McCosh. In the *Popular Science Monthly*, Vol. x, pp. 86, 100.

hoof, instead of the usual *pair*. The speaker stated that the toes of the hinder feet were united throughout, and were so far developed beyond the usual point attained by the ordinary ruminant. The toes of the fore limb were different, *only* one being *continued to the hoof*, all the *others being rudimental*." The bones belonged to the modern deer and were not found fossilized.

But suppose the case rested on the evolution of the horse alone? When Newton demonstrated the law of gravitation from atoms to apples and falling towers, what did he do? He asserted *universal* gravitation! Men came to him with objections and difficulties, some trivial and some serious. He answered somewhat in this wise. "Gentlemen, some of your arguments are trivial, I would not answer them if I could; some are serious, just *now* I could not answer them if I would; nevertheless gravitation *is* and it is *universal*." All the objections to evolution may not be answerable at present, nevertheless the philosopher is justified in asserting that evolution *is* and that it *is universal*.

Evolution a Grand Generalization.—Some doubting critics esteems us "far too much inclined to accept as 'grand generalization' a bold and unproved theory and a theory which is hostile in its influences to the reception of the simple truths recorded for our profit in the Bible." What these simple truths may be they have not stated, and perhaps it were better they should refrain from the statement. I know of no more happy mode of turning the truths of evolution against the Bible, than that pursued by some perverse theologians of boldly asserting that they are antagonistic to the Scriptures. The truths of science, as we have seen in former discussions respecting geology, were regarded as antagonistic to the Bible, and anti-scientists were forced to admit the Bible in error or resort to the only avenue of escape, by considering it wrongly translated or improperly understood. Would it not be wise to admit this may again be the case, rather than provoke opposition and the damaging criticism of evolutionary science?

As respects the epithet "grand generalization," and the unproved character of the evolution doctrine, I have something more to say. Our critics have evidently not made themselves familiar with the profound philosophy of Herbert Spencer, who has based his wonderful works upon evolution, and is drawing therefrom his great system of scientific thought, the most original and most

important undertaking of the age. This system is solidly based upon the sciences of observation and induction, and is undoubtedly the largest scheme of systematic philosophy. Herbert Spencer is author of the only complete systematic statement of the doctrine of evolution. Now this Herbert Spencer is described by the most competent judges to be a thinker of larger calibre than has hitherto appeared in England, as keen an analyst as is known in the history of philosophy, not excepting Aristotle or Kant. In the highest realms of philosophical investigation he stands equal to all his predecessors, and has taken his position in the foremost rank of living thinkers. Now if a man of the character I have here outlined has taken evolution as a profound and all comprehensive generalization, we surely may be permited to accept it as such. Let us not, my good critic, resemble the ostrich that hides her head in the sand and imagines that because she does not see, therefore neither can the world around see.

Our critics add that evolution is not proved. Do they suppose that such a host of men, eminent in science, besides the honored name above given, would stultify themselves by admitting its truth and proclaiming it to be an invaluable boon, had they not convinced themselves of its inherent worth by bringing to its investigation all the lights at their command? Let us see what kind of minds entertain a firm belief that evolution has been proved to be a true philosophy. "It is Mr. Darwin's misfortune to know more about the question he has taken up than any other man living," says the learned Huxley.

Sir Charles Lyell, after having for fifty years studied the subject of life in connection with the past changes of the globe, and embodied all the older views in all his numerous works, at length in the tenth edition of his "Principles of Geology," *abandoned the old ground as untenable*, and adopted the views presented by Darwin.

Dr. Asa Gray stated before the Association for the Advancement of Science, that he had repeatedly attempted to catch Darwin tripping, and had had referred to him many cases which he himself at the time considered opposed to the theory, but in every case had *been forced* to withdraw his objections. Thomas Meehan made the same remark. He had often supposed Darwin in error, but had *always found him right.*

Dr. Fritz Müller, an eminent German naturalist, says he took

no small pains to detect contradictions among the inferences as to the class of Crustacea to which he had devoted himself, and found none furnished by Darwin's theory.

Dr. Gegenbaur, author of "Outlines of Comparative Anatomy," which has been adopted as an authoritative text-book, has re-cast his work and embodied therein the Darwinian philosophy. He regards comparative anatomy as the *touchstone* of the truth of evolution.

Darwin's name is always mentioned among the German naturalists with the profoundest reverence. His theory is now the common starting point of German science in many departments of knowledge that would seem at first to be farthest from natural history. The recent selection of Darwin as an associate of the French Academy of Science, the very highest honor that contemporary wisdom can confer, mark emphatically the esteem with which he is regarded in France, long unwilling to admit the value of his labors.

Whether evolution is to be recognized is then no longer an open question. "It is enough that it is a mental view that answers to a great reality, and is undoubtedly the broadest principle of unification in nature the human mind has yet reached." As to whether it *is proved*, depends upon the individual temperament and capacity of him who examines it. To some minds there exists no possibility of proving the truth or falsehood of any moral questions or of any physical problems, unless they can be brought to the test of mathematics. Minds of this character should confine themselves to their proper sphere, they are beyond instruction and are incorrigible. Evolution has been proved, as have many other problems in physical and natural science; the ablest experts are perfectly satisfied, why should the popular mind withhold its assent? "I do not think that I am speaking too strongly when I say that there is now scarcely a single competent general naturalist who is not prepared to accept some form of the doctrine of evolution," says Prof. C. Wyville Thomson in his Introduction to "The Depths of the Sea," an account of the general results of the dredging cruise of the *Porcupine* and *Lightning*, 1868, 1869 and 1870, p. 9.

It may interest our readers to know to what extent the doctrines of evolution are taught in our higher institutions of learning. At Harvard every professor whose departments are connected with

biology, such as Gray, Whitney, A. Agassiz, Hagen, Goodale, Shaler, James, Farlow and Faxon, is an evolutionist, and man's physical structure they regard as no real exception to the law. They are all said to be theists and all conservative men. At Johns Hopkins University, Baltimore, which aims to be the most advanced in the country, evolution is held and taught. In the University of Pennsylvania all the biological professors are evolutionists, Leidy, Allen, Rothrock and Parker. At Yale, Michigan University, Brown, Cornell, Dartmouth, Bowdoin, Princeton, the biological professors are all in the same category. There can scarcely an exception be found. Wherever there is a working naturalist he is sure to be, almost without an exception, an evolutionist. Prof. James D. Dana often adduced as an opponent, in his new "Text Book of Geology," p. 341, says: "Its progress [the system of nature] if by divine power should be, as zoölogical history attests, a development, an unfolding, an evolution." "We challenge," says an ex-president of the American association for the advancement of Science, "to find three working naturalists of repute in the United States—or two (we can find one in Canada)—that is not an evolutionist. I should regard a teacher of science who denied the truth of evolution as being as incompetent as one who doubted the Copernican theory." (*Popular Science Monthly*, Vol. XVI, pp. 558–559.) "It is now regarded, among the active workers in science, as a waste of time to discuss the truth of evolution. The battle on this point has been fought and won."

Evolution demonstrated by the Changes going on around us.—Those of our critical friends to whom evolution is not to their understandings established on a basis of demonstration, I would refer to a very instructive paper republished in the supplement to the *Popular Science Monthly*, Vol. XV, entitled "Animals and their Environments." They will there find indubitable proof that certain animals were not originally created as they now exist, and that their surroundings have greatly modified their forms, and the doctrine of special creation demolished. Among others, the changes that take place in the flounder and other flat fishes are described, and the manner in which these fishes, originally formed symmetrically like others of their congeners, with eyes on both sides of their heads, swimming upright, and colored on the back and white on their under side, become, through want of a swimming bladder to preserve them in an upright position obliged

to turn upon their sides and to descend to the bottom of the water. Here they undergo a metamorphosis, which is a wonderful instance of the manner in which nature modifies animals and adapts them to new conditions. The flounder thus placed at the mercy of its environment, begins to change color on the under side which becomes whiter from the absence of light, while the upper side becomes darker from its continuous action. The eyes were originally on opposite sides of the head, as in normal fishes, but the eye which was created upon the side which is now undermost, gradually moves around and takes its place upon the upper side, thus presenting the appearance, familiar to any one who has seen the turbot or flounder, of an animal with both eyes on the same side of its head.

They will there find, also, a notice of the transformation of the North American axolotl (Siredon) into a completely different animal, with which it was not known to have near relationship, and already placed in a different genus. They will also see an explanation of the manner in which the Alpine salamander has probably changed from an egg-bearing to an ovo-viviparous animal in places too dry for the production of animals having gills in their earlier stages, by causing the eggs to hatch within the mother, and the young to pass their gill stage within the fluids of her body instead of in water, as do the young of other newts or salamanders.

There is an excellent lesson in evolution to be found in the history of the Sacculina, which is a parasite upon the hermit crab. This illustrates the manner in which *degradation* is brought about, for this is often as striking a process of evolution as is *advancement* to higher forms. This Sacculina, as it is found on hermit crabs, is a sort of cylindrical mass with a bundle of roots growing from one side; sense it has none, limbs none, organs none, and hardly the vestige of organs and only the faintest traces of mouth and intestines. It is an embryo but not far enough advanced to show what it is to be. Listen to its history. This structureless lump began life as a little barnacle crab, swimming in the ocean, having a symmetrical body, three pairs of legs and one eye, and bearing a close resemblance to the embryos of all crabs in this state, which is called the "nauplius stage," or that first to develop out of the egg. Very soon our nauplius barnacle leaves off roving and attaches himself to the soft hind parts of a

relative, the hermit crab, and begins to suck the juices of his host. He soon loses his eye, then his limbs, then the segmentation of his body, then his head, his intestines, his everything that seems to constitute him an animal. He grows too lazy and sinks too low even to eat. Around his mouth develop a bundle of roots which spread through the soft body of the hermit crab as roots of a plant through the ground, and he sinks to the level of a mere automatic existence. Now his host, the hermit crab, and this degraded Sacculina started alike, and in the long ages, before the hermit had come to be what he is, the common ancestor of all crabs, wore, in maturity, the form of this parasite in its nauplius stage. Parasitism has pulled the Sacculina down to utter debasement, as it has all other parasites whether in man or animals. Thus creation advances and recedes, and numberless instances of both processes could be found in nature, for description of some of which I would refer to "Life History of our Planet," by Wm. D. Gunning, and "The History of Creation," by Ernst Haeckel.

The above instances of actual transformation among hundreds that could be adduced, the result of their surroundings, changes brought about by changed conditions, must give our critics reason to pause before they again attempt to deny that Darwinism can bring to its defence the "hard logic of facts" and sound induction.

We have occasionally heard the remark, that it is degrading to the self-respect of man to consider himself descended from a long line of animals, beginning with the polyp or ascidian. Let us consider that in evolution we have no *new truth*, but an old truth in a new form, the evolution of the individual by a slow process from a microscopic germ. Everybody knows that this is the process of development through which every one of us has passed. Yet it has never interfered with our belief in an intelligent Creator. When asked who made us, we say "God made us." But how were we made? The only true answer must be, by a process of evolution, a slow process of evolution from a microscopic sphere of unorganized protoplasm, the germ cell. This knowledge does not lessen our respect for the dignity of man, why then should it be different in the case of the origin of our species and of all species by evolution.[1]

[1] The earnest reader who desires to become acquainted with the most advanced views of students of biology, and the recent demonstrations of the stages through

The Struggle for the Liberty of Science.—To those who are acquainted with the history of physical discovery, and the great struggle for the liberty of science, the conflict waged with evolution by theological error seems but a continuation of the struggle that has lasted for so many centuries. "Unfortunately, some good men started, centuries ago, with the idea that purely scientific investigation is unsafe, that theology must intervene, and thus began this great war." Among the leading innovations advanced by science, there are few indeed that have not been opposed by theologians. The idea that the earth is a globe was pronounced fraught with danger to Scripture—that is the *popular interpretation*—and the great majority of the fathers of the church denied that a man could be saved who believed the earth to be round and inhabited on its opposite sides! It was not until Magalhaens sailed around the earth, that theologians subsided. The Copernican theory of the heavens, now universally accepted, was solemnly condemned, and to read the book of Copernicus was to risk damnation. H. Bruno was hunted from land to land and finally burned alive because of its advocacy. It was not established until the telescope of Galileo confirmed its truth, and even then, many either declared it impious to look into the telescope of Galileo, or if they saw the satellites of Jupiter, denounced them as delusions of the devil! The story of the unfortunate Galileo, and his sorry recantation of the truth, is known to all intelligent readers.

"There has been raised the same cry in all ages—the same we hear in this age—for curbing scientific studies." The anatomist Vesalius was hunted to death because he dissected the human body. Theology denounced in sermons "the dangerous and sinful practice of inoculation" for the small-pox, and Jenner's vaccinnation was declared as "bidding Heaven defiance." Even the use of chloroform in our own day, for theologians have not learned wisdom, was, from the pulpit, declared "contrary to Holy Writ!"

which the genesis of man has been effected, should consult a series of papers published in the *Penn Monthly* for April, May and June, 1877, and since re-published by E. Stern & Co., 125 and 127 N. Seventh street, Philadelphia. These papers, by L. A. Ward, A.M., are entitled "Haeckel's Genesis of Man; a History of the Development of the Human Race," being a review of his Anthropogenie, embracing a summary and exposition of his views and of those of the advanced German school of science, and since translated into English and published, and entitled "The Evolution of Man," by that vigorous expositor of this doctrine. New York, 1879.

It is difficult to realize that within our own memory a similar battle raged between the advocates of what was called the "sacred theory of the earth" and the views of geologists, and that anathema, styled arguments, were used in the nineteenth century similar to those hurled at science in the middle ages. In our own day geology has been declared "not a subject of lawful inquiry," and denounced as a "dark art, dangerous and disreputable," as "infernal artillery," and as "an awful evasion of the testimony of revelation."[1]

There have been many other battle fields, equally instructive, in which theologians have opposed the progress of the age and blindly fought against the good of mankind. Fanning mills were at one time denounced as contrary to the text, "the wind bloweth where it listeth" and as leaguing with Satan, who is "the prince of the powers of the air," and as sufficient cause for excommunication from the Scotch church.[2] The railroad and the telegraph have been denounced from a noted pulpit as "heralds of Anti-Christ!!"

But perhaps the most ridiculous proposal to prove that "it is supreme folly to talk of accommodating Christianity to Darwinism," is that announced in the *Church Journal*, by a reviewer of Dr. Hodge's book against Darwinism, which is as follows: "If we have all, men and monkeys, women and baboons, oysters and eagles, all 'developed' from an original monad and germ, then St. Paul's grand deliverance, 'All flesh is not the same flesh. There is one kind of flesh of men, another of beasts, another of fishes and another of birds; there are bodies celestial and bodies terrestrial'—may be still very grand in our funeral service but very untrue to fact." Oh sad! sad! that any man supposed to be sane could give forth such an utterance as argument! What good can possibly result to mankind from the opposition of ignorant men who stand upon high places "screaming in wrath at the advance of science." In every case this ecclesiastical war, during its continuance, has tended to drive multitudes of thoughtful men away from religion, and theologians have to answer for this result.

In all this long warfare the victory has invariably been with science, and "the whole civilized world now declares that it was

[1] See "Geology and Scripture," by Pye Smith, D.D., pp. 156, 157, 168, 169.

[2] "Burtons' History of Scotland," Vol. VIII, p. 511.

won for religion—that thereby was infinitely increased the knowledge of the power and goodness of God." "Let then the warfare of science be changed," says Prof. A. D. White, from whom we have derived several of our illustrations. "Let it be a warfare in which religion and science shall stand together as allies. Let the fight be for truth of every kind, against falsehood of every kind, for the living kernel of religion rather than the dead husks of sect and dogma, and the great powers whose warfare has brought so many sufferings, shall at last join in ministering through earth, God's richest blessings."[1]

Conclusion.—Want of a scientific habit of mind is the source of much of the prevalent misconception as to what constitutes adequate proof in natural science.

In order to understand the doctrine of descent, or the theory of evolution, it is indispensable that the inquirer possess a general knowledge of biological phenomena. It must be evident that a certain degree of general culture, and especially a philosophical education, is requisite to enable one to comprehend the individual and palæontological history of development. This preparation unfortunately many persons in our day do not consider at all necessary. "One hears hundreds of half educated persons pass a final judgment upon it, although they acknowledge that they know nothing either of botany or of zoölogy, of comparative anatomy, of palæontology or of embryology." Hence it happens, as Huxley well says, that "most writings published against Darwin are not worth the paper upon which they are written."—Quoted by Haeckel in his "History of Creation," Vol. II, p. 346.

Among many recent opinions expressive of approval of the doctrines of evolution, the following may properly conclude this article.

Prof. Stanley Jevons, one of the clearest thinkers of our day, and the master spirit who has proved that John Stuart Mill's great work on "Logic" is essentially illogical, admits that Herbert Spencer has made a new epoch in philosophic thought. When speaking of Spencer's "Data of Ethics," which is the culmination of his philosophy, Prof. Jevons asserts that "Spencer has pointed out that the universe is one deep-laid framework for

[1] "The Warfare of Science," by Andrew Dickson White, LL.D, President of Cornell University. N. Y., Appleton & Co., 1877. Pages 150, 151.

the production of beneficent contrivances," and that it "is a deep-built scheme working towards goodness and happiness." "Spencer calls upon us to admit the inventing machine of evolution, a 'machine' which is the most comprehensive of all machines, because it is ever engaged in inventing beneficial inventions *ad infinitum*." "We must accept the philosophy," says Jevons, "if it be true, and for my part I do so without reluctance." "According to Spencer," continues this admirable critic, "we are the latest manifestation of an all-prevailing tendency towards the good, the happy, and that we are no lump of protoplasm but the creature of a Creator."—*Contemporary Review*, Nov., 1879. Let it be remembered that as the sagacious Dr. McCosh expresses it, "Herbert Spencer is to a large extent the author and is certainly the organizer and the embodiment, personification and expression of development."—*Princeton Review*. "Theologians have ever been free in the application of damnatory expletives to scientific ideas which do not conform to their standard," but it is very pleasant to turn from denunciation and anathema to the language of *The Nonconformist* of November 5th, a journal of the English orthodox dissenters, and there read the following opinion of Spencer's "Data of Ethics," his last production, and the culmination of his system of philosophy. Speaking of the glimpses it affords into the future which its author anticipates, *The Nonconformist* remarks, "No loftier view, we venture to say, was ever entertained." "The optimism of Mr. Herbert Spencer is as pure as that of the most spiritual seers of the past, and it involves as radical a change in human nature as that demanded by the New Testament. It is, in his own words, 'a rationalized version of its ethical principles.' The fact that they are Christian in their essence is rather a hindrance to their acceptance, since conventional Christianity practically repudiates the ideal morality of its founder."

We never expected to live to see the name of Herbert Spencer, the embodiment, personification and expression of development "received with applause in a great religious convention of orthodox people, but if the report of the London *Times* of October 10th can be trusted, this extraordinary phenomenon has actually occurred! In that convention the Rev. Prof. Pritchard gave an eloquent and powerful address on "The Religious Benefits from Recent Scientific Research," in which the doctrine of evolution

was assumed as true, and as in entire harmony with all essential religious truth. He was followed by the Rev. Prof. Watkins, of St. Augustine College, Canterbury, who spoke on the same subject, and said "he felt sure that when the history of the century came to be written from the standpoint of the future, the name of Herbert Spencer would be found in the very first rank of English thinkers." "These expressions indicate a very marked progress in religious liberality," says the editor of the *Popular Science Review* of January, 1880.

Prof. James D. Dana in his new "Text Book of Geology," p. 346, expresses his opinion on this wise: "That the system of life exhibits so perfect harmony and so complete oneness of law in its several lines and successions, that it may be truly called a system of development or evolution, whatever the method by which it was carried forward," and that, "It is also certain that science, whatever it may accomplish in the discovery of causes or methods of progress, can take no steps toward setting aside a Creator. Far from such a result, it clearly proves that there has been not only an omnipotent hand to create and to sustain physical forces in action, but an all-wise and beneficent Spirit to shape all events towards a spiritual end."—Ibid, p. 351.

Thus it is easily shown that the opinions of men disqualified by age or a conservative spirit, interested prejudice or enfeebled faculties, should not be regarded when opposed to new doctrines in science; that those who have devoted themselves to science have, whenever free from the prejudices of education, heartily embraced the new views; and finally that even those who have been regarded as the ablest defenders of the truths of revelation when enlightened by acquaintance with science and penetrated by its spirit, become generous defenders and fearless advocates of evolution and absolve it from all charges of atheism and want of scientific basis.

THE SUPPOSED DIMORPHISM OF LITHOSPERMUM LONGIFLORUM.

(*L. ANGUSTIFOLIUM* MICHX. OF GRAY'S SYNOPTICAL FLORA.)

BY PROF. C. E. BESSEY, M.SC., PH.D.

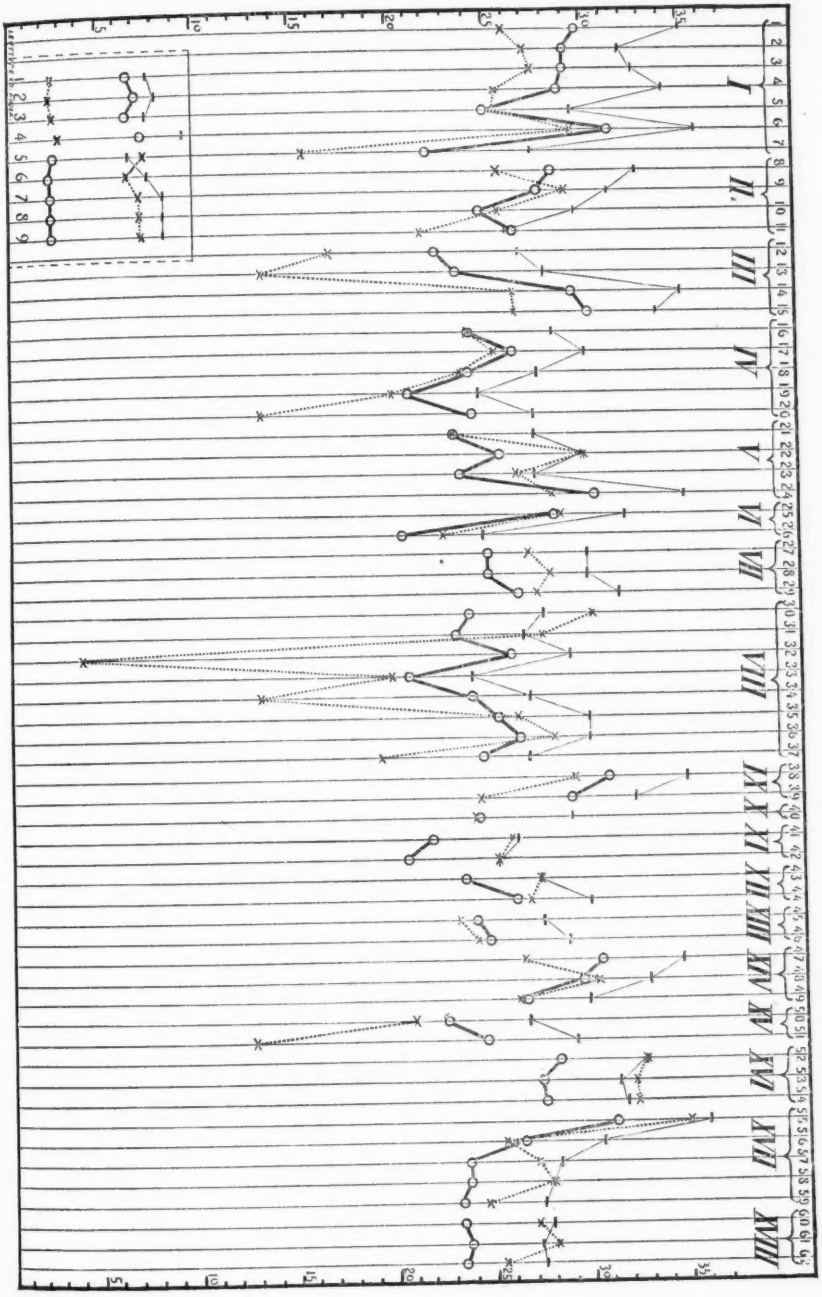
THE plant under consideration is a common herbaceous perennial of the prairies and great plains of North America. In the latter part of April and during the month of May it produces flowers with bright yellow salver-shaped (*hypocraterimorphous*) corollas, whose tubes are about thirty mm. (one and one-fifth inch) long, and from two to three mm. in diameter. About the first of June, in Central Iowa, these large flowers suddenly disappear, and from this time forward until the autumn frosts, they produce only small cleistogamous flowers.[1] The corolla lobes of the latter cohere somewhat, and remain closed, and in this condition the total length of the corolla is from five to seven mm., the tube itself being no more than three to five mm. long. Both kinds of flowers produce seeds, and I have not observed any difference in their relative fertility, although there are actually at least ten times as many seeds produced during the season by the small flowers as by the large ones, for the reason, however, that there are many more of the former flowers than of the latter. Of the small flowers I will have somewhat to say at another time; what I wish particularly to notice at this time is the relative position of stamens and stigma in the large early flowers.

An examination of a number of flowers shows that in some the anthers are higher than the stigma, while in others they are lower, and unless careful measurements are made, one is led to consider this as a case of dimorphism of the sexual organs (the heterogonous dimorphism of Dr. Gray, and heterostyly of Hildebrand, Darwin and others), a supposition which is rendered still more probable by the well-marked dimorphism of the flowers of the nearly allied *Lithospermum canescens* Lehm. However, after making a large number of very careful measurements, I have no hesitation in saying that in the plants as they occur in Central Iowa there is no dimorphism whatever, but that we have here a case of great and irregular variability in the length of the style and of the corolla tube, and that upon the varying length of the latter depends the varying position of the stamens.

In the following table the flowers of the first ten plants were measured May 4, 1878; those of the next five, May 19, 1877; and those of the remaining three, May 26, 1877.

[1] First noticed by M. S. Bebb. See AMERICAN NATURALIST, Vol. VII, p. 691.

Plant Numbers.	Flower Nos.	Length of Corolla Tube.	Height of Anthers.	Height of Stigma.
Plant No. 1	1	35.0 mm.	29.8 mm.	26.0 mm.
"	2	31.8 "	29.0 "	27.0 "
"	3	32.5 "	29.0 "	27.4 "
"	4	34.0 "	28.6 "	25.4 "
"	5	29.3 "	25.0 "	25.4 "
"	6	35.7 "	31.2 "	29.4 "
"	7	27.3 "	22.0 "	15.8 "
Plant No. 2	8	32.8 "	28.4 "	25.7 "
"	9	31.3 "	27.8 "	29.0 "
"	10	29.6 "	24.8 "	25.8 "
"	11	26.0 "	26.3 "	21.8 "
Plant No. 3	12	26.8 "	22.7 "	17.0 "
"	13	28.0 "	23.7 "	13.2 "
"	14	35.0 "	29.4 "	26.3 "
"	15	33.8 "	30.2 "	26.4 "
Plant No. 4	16	28.2 "	24.0 "	24.0 "
"	17	30.0 "	26.2 "	25.4 "
"	18	27.6 "	24.0 "	23.7 "
"	19	24.5 "	21.0 "	20.0 "
"	20	27.4 "	24.2 "	13.2 "
Plant No. 5	21	27.4 "	23.2 "	23.2 "
"	22	30.0 "	25.8 "	30.0 "
"	23	27.4 "	23.6 "	26.4 "
"	24	35.0 "	30.4 "	28.2 "
Plant No. 6	25	32.0 "	28.2 "	28.4 "
"	26	24.8 "	20.8 "	22.6 "
Plant No. 7	27	30.0 "	25.0 "	27.0 "
"	28	30.0 "	25.0 "	28.0 "
"	29	31.6 "	26.4 "	27.2 "
Plant No. 8	30	27.8 "	24.0 "	30.3 "
"	31	26.8 "	23.3 "	27.8 "
"	32	29.0 "	26.0 "	4.0 "
"	33	24.4 "	21.0 "	20.0 "
"	34	27.0 "	24.0 "	13.4 "
"	35	30.0 "	25.4 "	26.4 "
"	36	30.0 "	26.5 "	28.3 "
"	37	27.0 "	24.8 "	19.4 "
Plant No. 9	38	35.0 "	31.0 "	29.2 "
"	39	32.4 "	29.0 "	24.4 "
Plant No. 10	40	29.0 "	24.4 "	24.2 "
Plant No. 11	41	26.4 "	22.0 "	26.0 "
"	42	25.4 "	20.8 "	25.4 "
Plant No. 12	43	27.4 "	23.6 "	27.4 "
"	44	29.9 "	26.1 "	26.9 "
Plant No. 13	45	27.6 "	24.1 "	23.3 "
"	46	28.9 "	24.8 "	24.1 "
Plant No. 14	47	34.7 "	30.4 "	26.6 "
"	48	33.0 "	29.7 "	30.2 "
"	49	29.9 "	26.6 "	26.1 "
Plant No. 15	50	26.9 "	22.8 "	21.0 "
"	51	29.2 "	24.6 "	12.9 "
Plant No. 16	52	32.7 "	28.2 "	32.7 "
"	53	31.4 "	27.4 "	32.2 "
"	54	31.7 "	27.4 "	32.2 "
Plant No. 17	55	36.0 "	31.2 "	35.0 "
"	56	30.4 "	26.4 "	25.6 "
"	57	28.2 "	23.6 "	27.1 "
"	58	27.9 "	23.6 "	27.9 "
"	59	27.4 "	23.3 "	24.6 "
Plant No. 18	60	27.9 "	27.1 "	23.6 "
"	61	27.1 "	28.2 "	23.8 "
"	62	27.4 "	23.3 "	25.4 "


I.
II.
III.
IV.
V.
VI.
VII.
VIII.
IX.
X.
XI.
XII.
XIII.
XIV.
XV.
XVI.
XVII.
XVIII.

These measurements are more readily compared when presented in a diagrammatic form (see Plate). In this the length of the corolla tubes is indicated by the length of the vertical line measured from the bottom line to the mark –, the height of the anther by o, and of the stigma by ×. For greater distinctness the similar points in all the flowers of each plant are connected by lines; the fine line thus indicates the variation in length of corolla tubes, the heavy one of the position of the anthers, and the dotted one, of the stigmas. The scale is magnified three times.

The remarkably short style of flower No. 32, bore a distinctly two-lobed stigma, which under a lens was seen to be papillated. I think it was functional. In the case of flower No. 51, there is some doubt as to whether or not the stigma was functional; the shortness of the style may have been due to injury. In all other cases there were no reasons for supposing the stigmas functionless.

As it is well known that in cases of heterogonous dimorphism the pollen grains of the two forms differ in size, I made many careful measurements of the pollen of flowers from seven different plants, and found considerable variation in size. The grains when dry are considerably elongated, being prolate-spheroidal in shape, but when wet they swell up and become spherical. The following measurements show the variations:

Flowers 1 to 7,	pollen dry, prolate-spheroidal....	.025 × .035 mm.
" 15,	pollen dry, prolate-spheroidal.....	.025 × .035 "
" 16 to 20,	pollen dry, prolate-spheroidal...	.025 × .035 "
" 21,	pollen wet, spheroidal.....	.035 "
" 22,	pollen dry, prolate-spheroidal.....	.025 × .035 "
" 23,	pollen wet, spheroidal.....	.035 "
" 52,	pollen wet, spheroidal.....	.042 "
" 53,	pollen wet, spheroidal.....	.039 "
" 54,	pollen wet, spheroidal.....	.038 "
" 55 to 59,	pollen wet, spheroidal.....	.039 "
" 60 to 61,	pollen wet, spheroidal.....	.039 "
" 62,	pollen wet, spheroidal.....	.042 "

It will be difficult to see, in these measurements, any evidence of dimorphism as to the pollen grains. It may be interesting to note here that the spherical pollen grains of the cleistogamous flowers have a diameter of only .025 to .027 mm.

If now we compare the foregoing measurements with similar

ones of *Lithospermum canescens* Lehm., we may see how far *L. longiflorum* is from showing dimorphism:

Plant Nos.	Flower Nos.	Length of Corolla Tube.	Height of Anthers.	Height of Stigma.	Pollen.
Plant No. 1	1	7.8 mm.	6.8 mm.	2.8 mm.	Pollen grains ovoidal, slightly constricted in the middle. .019 × .03 mm.
"	2	8.1 "	7.1 "	2.5 "	
"	3	7.6 "	6.6 "	2.8 "	
Plant No. 2	4	9.6 "	7.3 "	3.0 "	
Plant No. 3	5	6.8 "	2.8 "	7.6 "	Pollen grains oblong, much constricted in the middle. .01 × .019 mm.
"	6	7.8 "	2.5 "	6.8 "	
"	7	8.6 "	2.7 "	7.3 "	
"	8	8.6 "	2.7 "	7.3 "	
"	9	8.6 "	2.7 "	7.3 "	

These measurements are entered upon the diagram (Plate) at the lower left hand corner, upon the same scale as those of *L. longiflorum.*

The following facts are clearly shown above in the case of *L. longiflorum:*

1st. The length of the corolla is exceedingly variable.

2d. The distance from the anthers to the top of the corolla tube is approximately uniform, so that the position of the anthers is largely dependent upon the length of the corolla tube.

3d. The length of the style is even more variable than that of the corolla tube.

Have we here a case of incipient heterostyly; or has this species but recently (since falling into cleistogamy) abandoned its former heterostylous form and habits? Probably there is some connection between the cleistogamy of the later flowers and the irregularity of the earlier ones.

——:o:——

NOTICE OF SOME AQUATIC WORMS OF THE FAMILY NAIDES.

BY PROF. JOSEPH LEIDY.

THE little worms of the family of Naides, comprising the genera Nais, Pristina, Stylaria, Dero, Æolosoma, Aulophorus, Chætogaster, etc., are common in ponds, ditches and other quiet waters, mostly living among various aquatic plants, or in the superficial sediment. They have always been viewed with special interest from their conspicuously exhibiting the process of multiplication through division, often being seen in a string of

from two to four individuals together. From the want, in many cases, of sufficiently complete descriptions and accurate representations of the European forms, there is more or less uncertainty how far ours may agree with or differ from them.

Among our Naides I have observed several species pertaining to or nearly allied with the singular genus Dero. One of these, formerly described under the name of *Dero limosa* (Proc. Acad. Nat. Sci., 1857, 226), appears to accord so closely with the European species, *Dero digitata* of Oken, that better means of comparison may prove it to be the same. The latter, originally described and figured by Müller upwards of a century ago, "as the blind Naiad"—"*die blinde Naide*" (Von Würmen, Kopenhagen, 1771, 90, 95, Tab. v, Fig. 1–3) is represented with the body of the worm ending in a broad funnel-like pavilion opening obliquely upward and furnished with four pairs of divergent rays, successively increasing in length from before backward. Another European species, described by Udekem as *Dero obtusa*, is represented with two pairs of rays to the caudal pavilion (Bul. Acad. Sci. Belgique, 1855, 549; Mem. Acad., 1859, 18), and is likewise so described by Perrier (Archiv. Zool. Exp., Paris, 1872, 65). Semper has more recently described two species, *Dero rodriguezii* and *D. philippinensis*, which differ from the preceding and each other in the character of the caudal pavilion (Arbeit. Zool. Inst., Wurzburg, 1877, 106, 107).

Dero limosa is frequent, and is to be found creeping among aquatic plants or on the sides of the vessel containing the water in which they have been collected, or it may be observed partly buried in sediment, projecting from a short chimney of its own construction, rising above the surface of the sediment, and with the caudal pavilion expanded.

The characters of the worm are as follows: Body compressed cylindrical, transparent, with red blood. In an individual of a fourth of an inch in length, without signs of division, there were forty-eight rings, or body segments, of which about a dozen posteriorly became successively more and more rudimental in the disappearance of the podal stylets and bristles. In specimens exhibiting evidence of division into a series of from two to four individuals, measuring up to half an inch in length, and stretching even to three-fourths of an inch or more, the number of rings together did not appear to be greater, and sometimes was

less, ranging from forty-two to forty-eight. Head ovoid, with the upper lip conical and more or less angular and obtuse. Eyeless. Caudal ring expanding into a broad, membranous, funnel-like pavilion, opening in a slanting manner dorsally and supporting eight divergent rays (see Fig. 1); anterior pair of rays papilliform; the others digitiform and successively increasing in length to the last pair. The rays are capable of extension beyond and retraction within the border of the pavilion, and this is also retractile, and when closed in the lateral view look like the keeled prow of a boat. When the caudal pavilion is expanded, active ciliary motion is observed extending along the rays inwardly to the rectum, which motion most probably subserves a respiratory purpose.

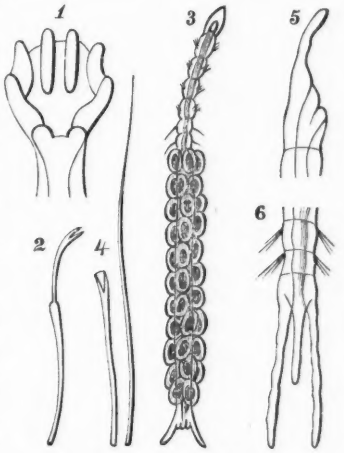


FIG. 1.—Caudal pavilion, with the rays not fully extended, of *Dero limosa*, viewed from above. FIG. 2.—A podal stylet. FIG. 3.—*Aulophorus vagus* within a tube composed of Plumatella statoblasts, magnified about six diameters. FIG. 4.—Spade-like podal stylet and bristle. FIG. 5.—Side view of the head of *Fristina flagellum*. FIG. 6.—Posterior extremity of the body of the same with its three caudal appendages.

The anterior four rings of the body are provided on each side with fascicles of four or five podal stylets, and the succeeding rings with fascicles of three or four stylets. The latter rings are also provided more dorsally on each side with additional fascicles mostly of a single stylet and a simple bristle. Stylets sigmoid with a median shoulder, and ending in a furcate hook (see Fig. 2).

Another of the little worms allied to the genus Dero, was collected together with some Plumatella scraped from a log in a ditch of the meadows below Philadelphia. It was in the latter part of September, and the water collected contained a great many detached statoblasts or winter eggs of the Plumatella. The worm first attracted my notice from the fact that it occupied a tube composed of the Plumatella eggs cemented together, and which it dragged about in the same manner as the larva of the Caddis does its case (see Fig. 3). The only worm of European waters which

appears to approximate this one, and which may prove to be the same, was described and figured a century and a quarter ago by the portrait painter naturalist, Rösel von Rosenhof, as the little supple water-serpent with two fork prongs—"*das geschmeidige Wasserschlänglein mit zwey Gabelspitzen*" (Insecten Belustigung, Nürnberg, 1755, Th. 3, 581, Tab. XCIII, Fig. 8–16). In character and habits it so closely accords with the genus Aulophorus of Schmarda (Neue wirbellose Thiere, 1861, II, 9), that I have referred it to a species of the same. Schmarda describes two species, *A. discocephalus* of Jamaica, and *A. oxycephalus* of Ceylon.

Our species I propose to name *Aulophorus vagus*. Its characters are as follow: Body compressed cylindrical, transparent, with red blood and yellowish-brown intestine. Single individuals of the third of an inch or more in length, composed of twenty-four to thirty-five rings. Head ovoid, extending as a conical upper lip, very mobile and changeable in form, obtuse or sub-acute, and minutely hirsute. Eyeless. Caudal ring contracted and furnished with a pair of long divergent digit-like appendages, which are straight or slightly incurved, blunt and minutely hirsute. Anal aperture surrounded by a rosette of half a dozen prominent, blunt, conical papillæ. The four rings succeeding the head furnished on each side with fascicles of seven to nine podal stylets; the succeeding rings, except the last, with fascicles of five to six podal stylets, which are shorter than the former. Podal stylets sigmoid, with a median shoulder, and ending in a furcate hook (Fig. 2). The same posterior rings furnished dorso-laterally with fascicles consisting each of usually a single moderately long bristle, and a single, nearly straight stylet, ending in a spade-like expansion (see Fig. 4).

Pharynx capacious, extending into the fifth ring, and narrowing into an œsophagus which ends in the intestine within the ninth ring. Generative organs unobserved. Worm of three to five lines in length, or more, according to its degree of extension. Living in a tube of its own construction which it drags about with it. The tube is composed of a transparent cement or basis incorporated with various materials, such as vegetal particles, sand, dirt, diatoms, spongilla spicules, etc. In creeping about among aquatic plants, Lemna and Wolffia, the worm stretches in such a manner that one-third of the body extends from the fore part of the tube, while the forked caudal extremity remains projected

from the back end. The worm moves in jerks, alternately extending the fore part of the body and projecting the podal fascicles forward and hooking into the surface on which it is creeping, and then contracting the fore part of the body and dragging along the back part enclosed within the tube. Frequently the motion is aided by the eversion of the pharynx, so as to form a disk or sucker which adheres to surfaces, like that of a leech. The movements occur in quick succession, so that the worm creeps about quite actively. At times the worm will double on itself and in this way pass through its tube and reverse its direction. At times too it will leave its tube and creep about without one. The papillæ of the anal aperture are clothed with vibratile cils, which produce an active current inwardly as observed in Dero.

Another little Naiad with conspicuous caudal appendages, in all other respects except in the possession of the latter, resembles Pristina, and I have therefore regarded it as such, with the name of *Pristina flagellum.* Its characters are as follow: Body compressed cylindroid, transparent, with red blood. In a specimen one-fourth of an inch long and exhibiting evidence of division into two individuals, there were about sixty rings, or thirty to each division. Head conical and prolonged into a digit-like upper lip (Fig. 5). Eyeless. Caudal ring furnished with three long digit-like, blunt appendages, trailing behind; the lateral pair nearly twice the length of the intermediate one (Fig. 6). Podal stylets in fascicles of four, on each side ventrally, to all the rings except the terminal ones; sigmoid with a median shoulder and ending in a furcate hook. Bristles to all the rings dorso-laterally, except the terminal ones, in fascicles of three to six.

Length of worm, 6 to 7 mm.; breadth 0.3 mm.; length of digit-like upper lip from the mouth, 0.25 mm.; length of lateral caudal appendages, 0.75 mm.; of intermediate one, 0.375 mm.; length of bristles, 0.25 to 0.375 mm. Creeping among aquatic plants in the ponds of sphagnous swamps, New Jersey and Pennsylvania.

AMERICAN WORK IN THE DEPARTMENT OF RECENT MOLLUSCA DURING THE YEAR 1879.

BY WILLIAM H. DALL.

IT has not been practicable for the writer to emulate the *Zoölogical Record* in minuteness of detail, however desirable that course might have been for some reasons. It is possible that some minor papers may have been overlooked from not having been sent to the Smithsonian Institution or the writer during the year, but it is not likely that anything of importance has escaped notice. It was open to the writer to make this article a mere catalogue or a review of work done. He has chosen the latter as the most useful course, and has freely expressed his opinions in regard to the papers enumerated. It is a subject for regret that, in America, among those who are interested in Mollusca especially, the veterans are passing away and few come to fill their places. This is perhaps due to the absence of any satisfactory text book, the condition of the nomenclature and the inferior position occupied by the groups in most manuals of zoölogy, so far as treatment is concerned. We may hope that the laboratories of Prof. Alexander Agassiz and of the Johns Hopkins University, with the other seaside summer schools, may produce good fruit in this direction. There is certainly no department as a whole in which more work must be done of all (except merely descriptive) kinds, before the science can be put on a satisfactory footing.

Even under the present adverse circumstances, a creditable amount of good work has been done in several directions, and we may reasonably expect that succeeding years will be hardly less fruitful. The harvest truly is plenteous but the laborers are few.

General Works on Mollusca.—But one publication which can claim to be of this nature has appeared in America in 1879. This is a "Manual of Conchology, structural and systematic, with illustrations of the species," by Geo. W. Tryon, Jr.; 8vo, Philadelphia, the author, 1879, *et seq.* Of this, three parts of Vol. I, *Cephalopoda*, have come to hand, and include 192 pages of text and seventy plates. The scope of the work is thus stated by the author: It is to be a "Conchological manual, which, while more comprehensive than any similar work hitherto published, shall be so condensed in text and illustration, that it may be issued at a much more moderate price. It will include, in systematic

order, the diagnoses of all the genera and higher divisions of the Mollusca, both recent and fossil, and the descriptions and figures of all the recent species, together with the main features of their anatomy and physiology, their embryology and development, their relation to man and other animals, and their geological and geographical distribution." "Each part will be complete in itself, Part 1 will contain the Cephalopoda; the Muricidæ will follow." "Only 250 copies will be published." It is but fair to say that the parts of this gigantic undertaking, which have so far appeared, comprise the results of a surprising amount of industry.

Anatomy and Development.—Perhaps the most important papers which have appeared in this department during the year, are those of Prof. W. K. Brooks in the "Scientific Results of the Session of 1878, Chesapeake Zoölogical Laboratory;" 8vo, 170 pages, 13 plates, Baltimore, Johns Hopkins University, 1879.

Of the two papers referred to, the first on "The Development of *Lingula* and the systematic position of the Brachiopoda," is the most extended (35--112 pp., 6 pl.) and important. The first portion is devoted to a description of the features of the embryos of *Lingula* (*Glottidia*) *pyramidata* Stm., with a review of previous investigations on the same subject. The second part reviews the "Bearing of the development of *Lingula* upon the systematic position of the Brachiopoda." The several very diverse views of different authors are discussed in the light of the new facts previously set forth, and especially that theory held and expounded with so much energy and wit by Prof. E. S. Morse, that the Brachiopods were (1) Annelids or (2) "Vermes."

The important contributions to our knowledge of the early stages of Brachiopods, made by Prof. Morse in the past, entitle any views of his to respectful consideration, such as is here accorded to them, but with the result of dismissing the first (which indeed had never been accepted in literal fashion by any naturalist of standing except Prof. Morse) very briefly, and for the second, concluding that "the Brachiopods then are 'Vermes' in the same sense that the Echinoderms, Mollusca, Tunicates and Vertebrates are" (l. c. p. 102), and reiterating views expressed in 1876, to the effect that, "as soon as we recognize that the Lamellibranchs are not to be regarded as typical Mollusca, and that all of the latter are to be traced back to a 'Veliger,' all difficulty seems to disappear, and it becomes plain, not only that Mollusca and Mol-

luscoida are related, but that they are connected so closely that the advisability of such a division is very doubtful."

Ten years ago many crudities, due to the defective state of our knowledge of the development of the Invertebrata, obscured the relations of many forms now more or less thoroughly understood. At that time the present writer took strong ground in favor of a position essentially similar to that which more lately has received the support of Prof. Huxley, and which the labors of Brooks have more thoroughly elucidated and now placed on a firm basis. As this position was vehemently contested at that time by Prof. Morse, and was considered by other good naturalists as somewhat unsafe, it is with more than ordinary pleasure that the writer now records the latest step of progress which, while it has corrected many of his own misconceptions, has resulted in proving the essential correctness of the main features of his hypothesis of that earlier time.

It is hardly necessary to add that the Tunicata, then left by both Morse and himself, as well as the great body of naturalists, in the company of the Molluscoida, have since been effectually divorced from them, and may be said to have hardly found even yet, with relation to other invertebrates, a definite location.

The second paper of Prof. Brooks on "Preliminary observations upon the development of the marine prosobranchiate Gasteropods," concerns the early stages of *Astyris* and *Urosalpinx*, and comprises an abstract of observations, with one plate.

Still another report on important biological work in this department, is Prof. Brook's "Abstract of observations upon the artificial fertilization of oyster eggs and on the embryology of the American oyster." *Am. Journ. Sci.*, XVIII, No. 108, December, 1879, pp. 425–427.

Important differences of breeding habits are pointed out between the *O. virginica* of America and the *O. edulis* of Europe. The eggs of the American oyster are fertilized outside the body of the parent, and the young swim at large during the period in which the fry of the European species are sheltered in the mantle cavity of the parent. At the breeding season each individual adult contains only eggs or spermatozoa. Segmentation is completed in about two hours, and follows substantially the course described for other Lamellibranchs by Lovén and Fleming.

The oldest ones which could be raised were almost exactly

like the embryos of *Cardium* as figured by Lovén. The oysters seemed fertile at hardly more than one year of age, and from ripe individuals millions of ova were artificially successfully fertilized.

A short paper on the anterior pair of muscles of the oyster, usually overlooked in descriptions of the genus, was presented to the Philosophical Society of Washington, by W. H. Dall, and their probable homology with the pedal muscles of Dimyarians suggested.

In the Journal of the Cincinnati Society of Natural History, July, 1879, Prof. A. G. Wetherby gives some notes in regard to the anatomy of *Bulimnæa megasoma* Hald., especially in regard to the form and appearance of the soft parts, the digestive tract and the reproductive organs, which latter are illustrated by cuts.

In a paper read at a late meeting of the Boston Society of Natural History, by Prof. R. P. Whitfield, some singular changes in the soft parts of the above-mentioned species are described as produced during confinement in an aquarium of successive generations, the progeny of a single individual. An abstract of this paper has appeared in the NATURALIST (Vol. XIV, No. 1, p. 5–12). The individuals of successive generations diminished in size and the male organs disappeared. This, which has been ascribed by Hyatt to a change in temperature (l. c. p. 52), is perhaps more probably due to a deficient food-supply (this species, according to Wetherby, is partially carnivorous) and the action of the physiological law to which Meehan has frequently called attention, of the greater persistence in cases of pauperization, of female or mother-functions and members.

"On the jaw and lingual dentition of certain terrestrial Mollusks, by W. S. Binney, Bull. Mus. Comp. Zoöl., v, No. 16. 8vo, pp. 332, 2 pl. Cambridge University press, Dec., 1879.

This important though brief paper comprises anatomical notes, chiefly in regard to the radula, of *Onchidella* (*Onchidium*?) *carpenteri* Binney; *Zonites whitneyi* Newc.; *Z. subplanus* Binn.; *Janulus stephanophora* Desh.; *J. bifrons* Lowe; *Urocyclus kirkii* Gray (?); *Cionella gloynei* Gibbons; *Hemitrochus milleri* Pfr.; *Plagioptycha duclosiana* Fér.; *Microphysa stearnsii* Bl.; *Triodopsis vultuosa* Gld.; *Mesodon sayii* Binn. var. *Chilhoweensis*; *M. devia* Gld.; *Pomatia humboldtiana* Val.; *Ochthephila tiarella* W. and B.; *O. abjecta* Lowe; *Plebecula lurida* Lowe; *Leptaxis undata* Lowe; *Veronicella* (sp. indet.) and *V. olivacea* Stearns; *Hemphillia glandu-*

losa Binn. and Bl.; *Simpulopsis corrugatus* Guppy; *Bulimulus schiedeanus* Pfr.; *B. immaculatus* Ad.; *Macroceramus inermis* Gundl.; *Cylindrella Chemnitziana* Fér.; *Omalonyx felina* Guppy (united by Binney and Bland to *O. unguis*); *Arionta intercisa* Binn.; and *Vitrina latissima* Lewis, which is erected into a new genus (p. 333) under the name of *Vitrinizonites*. It is related to *Vitrina* and *Zonites*, but differs by satisfactory characters. For a new species of slug from Natal, Africa, the (preoccupied) name of *Chlamydephorus* (rightly *Chlamydophorus*) is proposed, the species taking the name of *Gibbonsii* after its discover. *Pupa cincinnatiensis* Judge, is said to be a synonym of *P. contracta* Say, and *Tectula lincta* Lowe, from Madeira, is said to be viviparous.

These notes are followed by systematic references to the notes on various species of Mollusks in regard to which Mr. Binney has published anatomical observations or figures; by a complete bibliographical list of Mr. Binney's numerous contributions to science; and by a useful list of the known genera of slugs with their generic characters as far as they could be ascertained.

Mr. Binney has also contributed to the Annals of the New York Academy of Sciences, I, No. 9, pp. 257–262, with Pl. XI (May 9, 1879), a paper on the jaw and lingual dentition of certain Costa Rican land shells collected by the late Dr. Wm. M. Gabb. He describes anatomical features of *Limax semitectus?* Mœrch, *Bulimulus irazuensis* Angas, and of undetermined species of *Glandina*, *Helix* and *Tebennophorus*, together with two new genera and species, *Velifera gabbi* (allied to *Helicarion*) and *Cryptostrakon* (mel. *Cryptostracum*) *gabbi*, a curious slug with a concealed rudimentary shell and teeth resembling those of *Polygyra*, etc.

The first essay toward a really scientific study of our American Nudibranchiata, is contained in a paper contributed by Dr. R. Bergh, of Copenhagen, to the Proceeedings of the Philadelphia Academy of Natural Sciences for 1879, pp. 71–132, "On the nudibranchiate gasteropod Mollusca of the North Pacific ocean, with special reference to those of Alaska," Part I, pl. I–VIII. This paper is almost wholly anatomical, and by the acknowledged highest living authority on the subject. Twenty-seven species are considered, of which two-thirds are new and most of the others are for the first time adequately characterized. The distribution of the North Pacific species is discussed, and the genera

subjected to analysis, while their exotic species are usually enumerated. Most of the forms are from Alaska, but several of the more elegant species are Californian, while a special interest attaches to the rediscovery at Unalashka, and identification by Dr. Bergh, of the singular and anciently described *Tritonia tetraquetra* of Pallas. A number of Cooper's ill-defined Californian species are now placed on a solid basis, and several new generic forms are characterized. The paper does not admit of a proper representation by an abstract, and the reader is referred for further information to the original. It will be followed by a second part containing eight additional plates, and is based, for the most part, on the collections of Mr. W. H. Dall in Alaska and California from 1865 to 1874.

Another paper, in part anatomical, based on the same collections, is that of Mr. W. H. Dall in the Proceedings of the U. S. National Museum, a "Report on the Limpets and Chitons of the Alaskan and Arctic regions, with descriptions of genera and species believed to be new" (l. c. pp. 281–344, Pl. I–V, Feb. 13, 1879). This paper contains a summary intended to exhibit all that is known in regard to the anatomy and development of the *Chitonidæ*, including the results of the author's investigations and a synopsis (with some additions and rectifications) of Carpenter's classification of the group, in which a large number of genera are for the first time characterized; and others, defined by Dr. Carpenter (in his table of the regular Chitons, 1873), are more fully alluded to. The plates represent dissections of the radula of forty-five species belonging to thirty-three genera, whereas not more than a dozen species had previously been figured, and of these only a few (by Sars and Lovén) in an intelligible manner. The author's observations so far as they extend agree in the main with those of Von Ihering, which were made about the same time at Trieste. The renal pore described by Ihering, but not found by Dall, appears from information received from the former, to have been due to a misconception. As the limpets had been already treated rather fully by the author, the list here given is merely a synopsis, with additions and corrections, of his previous work. The work so far as the region it covers has a somewhat monographic character, and it is hoped will serve as a preliminary to the elaborate monograph of Dr. Carpenter, which is in process of preparation under the direction of the Smithsonian Institution.

As a whole, the paper is too extended to admit of a thorough abstract. A few new Alaskan species are described in it.

In the Transaction of the Connecticut Academy, v., p. 177 *et seq.*, Prof. Verrill begins an exhaustive paper, largely anatomical, on the Cephalopods of the North-eastern coast of North America; Part I.—The gigantic squids (*Architeuthis*) and their allies, etc. The first two signatures of this paper bear date of December, 1879, and it is proper to call attention to it, though as a whole the paper will not make its appearance until some time in the present year, and therefore will more appropriately be discussed in a review of publications of 1880.

Descriptive, taxonomic and faunal papers.—While most of the papers enumerated under the preceding head, would, in part, be appropriately cited here, those about to be mentioned are such as could not properly be classed under the former caption.

Prominent among descriptive papers of each year for a long time, have been those of Verrill, based for the most part on material gathered by the U. S. Fish Commission and its collaborators. During 1879, however, the mollusca have been fewer than usual, and it begins to seem as if the molluscan fauna of the North-eastern American coast were pretty thoroughly described and enumerated so far as determination of the species is concerned. Still occasional novelties turn up, mostly deep-water or northern forms, and from time to time others may be expected. This year the American Journal of Science contains three papers by Prof. Verrill in which mollusca are described or enumerated.

In "Notice of recent additions to the Marine fauna of the eastern coast of North America, No. 3." l. c. XVII, March, 1879, p. 241–3, *Histioteuthis collinsii* Verrill is described and another cephalopod identified doubtfully as *Taonius hyperboreus* Stp. In the same, No. 4, April, 1879, pp. 311–15, *Acanthodoris ornata* and *citrina*, *Coryphella rutila* and *Cuthona stimpsoni* are described as new, while a number of notes are given relating to previously described species of gasteropods. In the same, No. 7, December, 1879, pp. 468–70, two new species and one new genus of cephalopods are described, namely, *Stauroteuthis syrtensis* Verrill, n. g. et sp. and *Octopus piscatorum* Verrill, sp. n. The former is stated to be somewhat distantly allied to *Cirroteuthis*.

Prof. Verrill also contributes a paper to the Proc. U. S. National Museum for November, 1879, pp. 165–205, under the title of

"Notice of recent additions to the marine invertebrata of the North-eastern coast of America," etc. Besides descriptions of many Polyzoa and a new Ascidian the author notes as new to the eastern coast, *Xylophaga dorsalis* Turton, *Lunatia nana* Möller (also found by Möller in Greenland, and by Dall in Alaska) and *Idalia pulchella* Alder and Hancock. *Dendronotus robustus* Verrill, is stated to be identical with and prior to *D. velifer* Sars, from Norway.

In the Proceedings of the Academy of Natural Sciences of Philadelphia for 1879, p. 16, Mr. W. G. Binney mentions *Arionta rowellii* and *A. facta* Newc., with *Binneya notabilis* Cp., as found on the Mexican island of Guadalupe off the coast of Lower California. He suggests that the Mexican genus *Xanthonyx* is probably synonymous with *Binneya*. In the same periodical Mr. Andrew Garrett gives a list of land shells inhabiting Rurutu, one of the Austral (Pacific) Islands with remarks on their synonymy, geographical range and descriptions of new species; l. c. pp. 17–30. It contains twenty-three species, of which eight are new. On page 31 of the Proceedings Mr. Garrett describes *Goniobranchus albopunctatus*, sp. n., from Huahine, Society islands.

In the *Canadian Naturalist*, VIII, n. s. No. 8, Mr. J. F. Whiteaves publishes a short paper of nine pages, "On some marine invertebrata from the west coast of North America," which contains among other things a very interesting list of mollusks from the coast of British Columbia, one of which, *Cardium richardsonii* is described as new. This paper (though stated to be published Dec. 20, 1878), is of such interest to the students of geographical distribution that I include a notice of it here. It partially fills a gap which has long existed in our knowledge of the invertebrata of the fauna existing between Puget sound and Alaska. This fauna for the most part is Oregonian in character and contains few locally characteristic mollusks.

In the report of the Chesapeake Zoölogical Laboratory (Johns Hopkins University), which contains the papers of Prof. W. K. Brooks, before mentioned, is a list by Mr. P. R. Uhler, of animals found at Fort Wool, in the Lower Chesapeake. This contains thirty-one species of mollusks, all of which had been previously known, though several were new to the region. It must be stated that the identification of one of these, as *Chiton cinereus* Lin., is doubtless an oversight; as that is a northern species, Arctic and

European in its distribution, and not known from any part of America.

In Prof. Wetherby's Notes on Limnæidæ, previously mentioned, he claims to have for the first time correctly identified *Planorbis glabratus* Say, since it was originally described, and characterizes as new *P.* (*Helisoma*) *duryi*, both coming from Florida.

In *Science News* for April 15, 1879, Mr. Arthur F. Gray notes the comparatively recent spread of *Litorina litorea* L., which, first described as American from Nova Scotia specimens, doubtless was brought over on ballast, and has reached as far south as Stonington, Connecticut. The writer can positively state that twenty years ago it was not found on the shores from Beverly to Boston, though now rather common there, and such records of its migration as the above are interesting and valuable.

In the Proceedings of the American Philosophical Society (Sept. 1879) pp. 282–288, Dr. J. G. Cooper publishes "Notes on some land-shells of the Pacific slope." This is chiefly a criticism of some of Mr. Binney's work. Dr. Cooper thinks that the little Alaskan *Patula* is not *pauper* of Gould, but a comparison with Gould's types would have led him rather to sustain the identification of Binney and Bland, as the specimens are precisely similar and from a similar faunal region.

The shells of the Colorado desert are the subject of an article by R. E. C. Stearns in the March number of the AMERICAN NATURALIST. Although fossilized shells, the paper has a right to mention here, from the fact that it is a matter of doubt whether all these species are fully extinct even in America, while Dybowski has described large numbers of *Tryoniæ* (under other names) from Lake Baikal, one species of which is hardly distinguishable from *T. clathrata* Stm., figured by Stearns.

Mr. W. W. Calkins, who has repeatedly visited Florida on scientific tours, published a paper on the "Marine Shells of Florida," in the Proceedings of the Davenport Academy of Sciences in 1878, comprising a catalogue, descriptions of supposed new species and some remarks on the distribution of species included in his list.

This paper was noticed in *Science News* of February 15, 1879, and in the number for April 15th, Mr. R. E. C. Stearns points out some errors of identification which occur in Mr. Calkins' paper, whereby West American and Floridian species were included under one name.

In Bulletin No. 14 of the U. S. National Museum, we have a "Catalogue of the Collection illustrating the animal resources and the fisheries of the United States," prepared under the direction of Mr. G. Brown Goode, and referring to the collection exhibited by the National Museum and the Smithsonian Institution at Philadelphia in 1876.

Part II, of this Bulletin (pp. 249–271) comprises the "Catalogue of illustrations of the Economical Invertebrates of the American coasts, by W. H. Dall." Nine pages (251–259) of this relates to Mollusks, in which, of course, the pearl shells and oysters occupy the larger part. Had the uses of exotic Mollusks also been considered, the list might have been considerably augmented; the number of species given among the Gasteropods and Lamellibranchs includes few except those actually used for food or bait. A very much larger number might have been enumerated as possibly available, but this was not thought desirable.

A very useful aid to all students of the fauna of the North-east American coast, is the "Preliminary Check-list of the marine Invertebrata of the Atlantic coast from Cape Cod to the Gulf of St. Lawrence, by A. E. Verrill," prepared for the U. S. Fish Commission, of which the author's edition was printed at New Haven in June, 1879. Four hundred and seventy-four species and varieties of Mollusks and Molluscoids are enumerated, and forty-three Tunicates, distributed as follows: Cephalopods, 12 sp.; Gasteropods (including 44 sp. Nudibranchiates), 187 sp.; Pteropods, 4 sp.; Solenoconchs, 3 sp.; Lamellibranchs, 122 sp.; Brachiopods, 3 sp. (and two doubtful ones); Polyzoa, 141 sp.; and Tunicates, 43 sp. and varieties. A comparison of these numbers with those of Stimpson's Smithsonian Check-list of 1860, "Arctic seas to Georgia," including practically all that was then known of the Atlantic coast, shows the vast progress that has been made. Stimpson's numbers are as follows: Cephalopods, 16 sp; Gasteropods (including 22 Nudibranchs), 240 sp.; Pteropods, 6 sp.; Solenoconchs, 2 sp.; Lamellibranchs, 189 sp.; Brachiopods 3 sp. (2 doubtful); Polyzoa, 27 sp.; and Tunicates 29 sp.; total for the whole Atlantic coast, 514 species and varieties, against 517 now catalogued for the small portion between the Gulf of St. Lawrence and Cape Cod alone.

This great advance may be almost wholly attributed to the researches of the officers of the U. S. Fish Commission and those

associated with them, and especially to the untiring activity of the author of this check-list.

In his "Zoölogy for Students and general Readers," by A. S. Packard, Jr., the nervous system and pedal ganglia and otocysts of *Mya arenaria* are figured from drawings prepared by Dr. W. K. Brooks. Prof. Packard also gives a general account of the anatomy of *Lunatia heros*, and of *Loligo pealii*.

A new form of *Helix* from California, apparently related to *H. mormonum*, is described by Mr. R. E. C. Stearns in the Annals of the New York Academy of Sciences, I, No. 10, Nov., 1879, article XXVI, with a figure, under the name of *H.* var. *circumcarinata* Stearns.

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RECENT LITERATURE.

SMITH'S BRAZIL; THE AMAZONS AND THE COAST.[1]—Of the many delightful books which have been written on Brazil, this is, to our taste, the most interesting. Its author was, for a time, a member of the Geological Survey of Brazil under Prof. Hartt, and brings to the task of writing a popular book, many qualifications. His work displays scientific knowledge, acute powers of observation, an insight into the social and business interests of the inhabitants, and an enthusiastic love of nature. His style is vivacious, and we are carried with ready facility from forests to fevers, from plains to insects, from politics to navigation, while a narrative of travel appears here and there as we pass from one scene to another. The variety of subjects treated will interest a large circle of readers. As Mr. Smith is an accomplished entomologist, his contributions to this department have an especial value. The statements of the results of a day's collecting of beetles are remarkable. On December 17th he took 394 specimens of 275 species in about eight hours. On January 29th, 471 specimens of 268 species. The famine of Ceara, 1877–78, of which Mr. Smith was an eye-witness, is graphically described. The industrial statistics will interest American merchant especially. The execution of the work, including the numerous wood engravings, is admirable.

NATURAL SCIENCE AND RELIGION.[2]—In these lectures Dr. Gray furnishes the theological students of Yale with his reasons for maintaining a belief in the evolution of animal and vegetable spe-

[1] *Brazil; The Amazons and the Coast.* By Herbert H. Smith. Illustrated by sketches by Champney, etc. New York, Chas. Scribner's Sons, 1879. 8vo, pp. 644.

[2] Two lectures delivered to the Theological School of Yale College. Chas. Scribner's Sons. 8vo, 1880.

cies. Though these are familiar to most of our readers, they are not so to the average theological student; so that our thanks are due to Dr. Gray for his clear and simple statement of them. He lays a good foundation for the further discussion of questions which more immediately interest theologians, viz: the evolution of mind and character. Into this field Dr. Gray does not enter, but confines himself to a pretty thorough exposition of common sense views of creation, such as would be naturally entertained by every healthy mind were it not for the difficulties raised by too comprehensive theologies.

MOSELEY'S NATURALIST ON THE CHALLENGER.[1]—In this record, by one of the naturalists of the scientific staff of the *Challenger*, we have probably the cream of the more important discoveries made by this famous expedition. The story is not told in an elaborate way, but rather as noted down originally in the author's note book and letters home. While immense collections have been made by this expedition to be elaborated by specialists in the volumes of the Admiralty reports, it is not improbable that the results already published by Mr. Moseley are quite as important as those yet to be worked out. We refer to his elaborate discussions on the development and anatomy of Peripatus, by which this singular form has been taken from among or near the worms and placed with the Tracheata; also to his papers on the Hydroid corals, Millepora, the Stylasteridæ and Heliopora. The results of these investigations were of the highest value to biological science. These, however, were not deep sea forms; of these the most important and aberrant was a deep sea ascidian (*Octacnemus bythius* Moseley). Mr. Moseley states that indeed the deep sea animals are mostly closely allied to shallow water forms. "They appear also to live associated together in closely the same manner as their shallow water representatives." Moseley says nothing as to the fact that these deep sea forms are a survival of the Cretaceous fauna, as they probably are — but the general results of the *Challenger* are but an extension of what had been brought out by the Scandinavian, American and British deep sea researches which had established the fact that there was a deep sea or abyssal fauna; the researches of Pourtales and Agassiz in the Floridan channel showing that this fauna, with its arctic waters, underlay, at depths below 500 fathoms, the tropical life and waters.

Agassiz's idea, however, Moseley says, that many important fossil forms might exist at great depths was also dispelled. This idea was, however, based on a misconception. The most generalized forms, those most likely to survive great vicissitudes and changes

[1] *Notes by a Naturalist on the "Challenger;"* being an account of various observations made during the voyage of H. M. S. *Challenger* round the world in the year 1872–1876. By H. N. Moseley, F.R.S., with a map, two colored plates and numerous wood-cuts. London, Macmillan & Co., 1879. 8vo, pp. 606.

of level and temperature, are forms like Lingula, Limulus and Amphioxus, which live in shoal water and evince the wonderful vitality which is the assurance of their high antiquity. It was, moreover, useless to look for allies of the trilobites in the abysses of the sea, when it was already known that in Limulus we had a form as closely allied to the trilobites as one order of insects are to another.

Mr. Moseley's book is unpretentious, thoroughly interesting from the large number of novel views and facts, and will remain the best popular record of the voyage of the *Challenger*.

CLARKE'S DEVELOPMENT OF THE SALAMANDER.[1]—The external changes undergone by one of our common salamanders are described and figured by Dr. Clarke in this interesting paper, which for the first time gives a connected account of the development of an American amphibian. The eggs of this common salamander are attached in bunches of from three or four to two hundred in a gelatinous mass to the stem of some aquatic plant or submerged leaves. After segmentation and the appearance of the medullary folds, with the groove between them, the folds close in, forming the neural tube. The body elongates, becomes ciliated and rotates horizontally upon its axis. The head is next marked off and the optic vesicles, branchial lobes and head-balancers appear; then the fore limbs begin to bud out, the heart soon pulsates, and then the nasal pits and mouth are indicated; the tail and dorsal fin grow rapidly and the branchial lobes are divided into three pairs of gills. The head, mouth and gills are elaborated, the digits on both pair of limbs appear, and by the hundredth day after segmentation begins, the gills are resorbed and the animal assumes the adult state.

PENNING'S TEXT BOOK OF FIELD GEOLOGY.[2]—The first edition of this valuable book appeared about a year ago and attracted considerable attention. The first edition contained 227 pages, while to this last edition about one hundred pages of new matter are added. The growing popularity of geological field excursions among the students of our higher schools and colleges, renders such hand books indispensable. The chapters on geological surveying, sections, lithology, &c., are handled in a practical manner, and are simple, clear and intelligible. The illustrations are also well chosen. Not the least important portion of this book is the section on palæontology, by Mr. Jukes-Browne. In it he shows very clearly the valuable aid of fossils in determining

[1] *The Development of Amblystoma punctatum Baird.* Part I. External. Extracted from Studies from the Biological Laboratory of the Johns Hopkins University, Vol. I, 1879.

[2] *A Text Book of Field Geology.* By W. HENRY PENNING, F.G.S. With a section on Palæontology. By A. J. JUKES-BROWNE, B.A., F.G.S. Second edition, 8vo, pp. 319. Geological map and twenty-nine wood-cuts. (London, Balliene, Lindall & Cox, 1879.

strata in the field, a subject which at the present day some otherwise excellent scientific men are attempting to depreciate.

A second work by the same authors on engineering geology will soon be published. It purports to be a practical guide in the interpretation of those geological phenomena by which engineering works, building materials and water supply are effected, and in the methods of surveying, by which such geological conditions are determined.

SKETCHES OF THE PHYSICAL GEOGRAPHY AND GEOLOGY OF NEBRASKA.[1]—This is one of the most interesting and valuable books yet published on the scientific and practical resources of the State of Nebraska. Prof. Aughey has been for many years a most enthusiastic student of its geography and geology, until he has become the reliable authority all over the country. His paper on the Loess published in the Annual Report of the Geological Survey of the Territories for 1874, called out a very complimentary letter from Mr. James Geikie, of Scotland. In this book he has elaborated his former sketches on various subjects connected with the State, and presented them in a clear and graphic manner, which cannot but render them very attractive to the general reader. Although the first edition has been issued but a few months, already a second edition is called for. We congratulate Prof. Aughey on his well-deserved success.

ARCHIVES OF COMPARATIVE MEDICINE AND SURGERY.[2]—We note with interest the appearance of this new periodical. Its objects are divided between economic and pure science, so as to appeal to a larger constituency than if its scope were confined to either alone. We note various interesting statements of observations on the pathology and anatomy of the lower animals, especially of the Vertebrata. One of these, on the Island of Reil, we transfer to our notes. The *Archives* has a wide field, and, under its present able editor, we hope for its success.

TRAQUAIR ON PLATYSOMIDÆ.[3]—This memoir fills a hiatus in our knowledge of palæozoic fishes, in a very satisfactory manner. As defined by Dr. Traquair, the family *Platysomidæ* includes the genera *Eurynotus* Ag., *Benedenius* Traqu., *Mesolepis* Young, *Eurysomus* Young, *Wardichthys* Traqu., *Chirodus* McCoy, and *Platysomus* Agass. These genera are fully defined from internal and external characters, and are illustrated by good plates, which include several restorations. Dr. Traquair has been very successful in working out the osteology of these forms, and in discovering

[1] *Sketches of the Physical Geography and Geology of Nebraska.* By SAMUEL AUGHEY, Ph.D., LL.D.

[2] *Archives of Comparative Medicine and Surgery;* a Quarterly Journal of the Anatomy, Pathology and Therapeutics of the Lower Animals. Edited by EDWARD SPITZKA, M.D. New York, W. L. Hyde & Co., Printers.

[3] On the Structure and Affinities of the *Platysomidæ*. By RAMSEY H. TRAQUAIR, M. D. From the Transactions of the Royal Society of Edinburgh, Vol. XXIX, 1879.

new characters. He throws much light on their systematic position, especially in demonstrating the differences which distinguish them from the *Dapediidæ*, and their near affinity to *Palæoniscidæ*. Indeed the author scarcely adduces sufficient ground for their separation as a family from the latter.

Two of the important characters on which he lays most stress, viz., the non-coincidence of the median fin-rays with their interneural and interhæmal bones, and the absence of suboperculum, undoubtedly remove the fishes which possess them, from the order *Isospondyli*, where the present writer formerly placed them. The degree of ossification of the cranial and vertebral bones, is of less importance. Dr. Traquair places this family and its allies in the *Chondrostei* (which he calls *Accipenseridi)* with *Accipenseridæ*, etc. But he does inform us as to the structure of the articulations of the pectoral and ventral fins; perhaps his material does not permit it. A comprehension of this part of the skeleton, is, in the present writer's estimation, necessary to the determination of the position of any fish in the system. The *Chondrostei* form a group, intermediate between the *Crossopterygia* and other fishes (or *Actinopteri*)[1] having the ventral fin of the former, and the pectoral of the latter. From all the evidence yet advanced, the ventral fins of this group appear to be those of the tribe *Actinopteri*, with which they should probably be associated. In this group they will occupy the lowest position, below the *Ginglymodi (Lepidosteidæ*, etc.), differing from all the fishes which compose the former, in the primitive character of the fin-rays already mentioned. They will form a distinct group of the same rank as those I have called orders, to which the name of *Lysopteri* may be given. The definition will be, *actinopterous fishes with the median fin-rays not joined to the interhæmal and interneural bones, and not coinciding with them in number; and without suboperculum.*

Dr. Traquair shows the entire insufficiency of Prof. Young's system of palæozic fishes, but seems not to be sure but that *Lepidosteus* has some relatives from below the upper cretaceous formations. He writes ganoids, with a capital G, as though it were a natural group. Certainly the arguments adduced by the supporters of this division (*e. g.* Dr. Lütken), as well as by its opponents, show that it does not conform to Dr. Traquair's definition of a true division (p. 386); "What we require is that the assemblage of characters shall be exclusive."

The characters adduced by Dr. Traquair, appear to confirm the writer's reference of the *Dapediidæ* to the *Isospondyli.—E. D. C.*

WE HAVE SELDOM MET with a case of more unblushing piracy than lies before us in "Rand, McNally & Co.'s Geological and Mineralogical Map of Colorado, copyright secured 1879."

[1] Proceed. Amer. Ass. Adv. Sci. 1878. 293.

Although this is simply a copy of Dr. Hayden's U. S. Geological Survey Map, no recognition of the fact appears on the publication in question. The officers of United States Surveys are very liberal with their publications, and will furnish every facility to publishers and editors, expecting only the easily given return of credit. This every compiler is bound to give, by all sentiments of both honor and patriotism.

RECENT BOOKS AND PAMPHLETS.—De i de brasilianske Knoglehuler fundne Navlesvin-Arter. Af. J. Reinhardt. (Repr. from Vidensk. Meddel. fra den naturh. Foren. i Kjöbenhavn.) 8vo, pp. 33, 1880. From the author.

Reports on the results of dredging under the supervision of Alexander Agassiz, in the Caribbean sea, 1878–79, by the United States coast survey steamer *Blake*, Commander J. R. Bartlett, U.S.N., commanding. VI. Report on the Corals and Antipatharia. By L. F. Pourtales. (In Bull. Mus. Comp. Zoöl., Vol. VI, Feb., 1880.) From the museum.

Some thoughts on the glycogenic function of the Liver. II. Disposal of Waste. By Joseph LeConte. (Ext. from Am. Jour. Sci., Vol. XIX, Jan., 1880.) 8vo, pp. 25–29. From the author.

The old river-beds of California. By Joseph LeConte. (Extr. from Am. Journ Science, Vol. XIX, March, 1880.) Pages 176–190. From the author.

North American Mesozoic and Cænozoic Geology and Palæontology. By S. A. Miller, Esq. (Extr. from Journ. Cincin. Soc. Nat. Hist., Oct., 1879.) 8vo, pp. 44. From the author.

Mémoire sur la Faune ichthyologique de l'Isle Saint-Paul. Par M. H.-E. Sauvage. (Extr. from Arch. de Zool. exp. et generale, t. VIII, 1879.) 8vo, pp. 45, pls. I–III. From the author.

The American Journal of Microscopy and Popular Science. Vol. V, No. 3, March, 1880. From the editors.

Proceedings of the Academy of Natural Sciences of Philadelphia. Part III, Nov. and Dec., 1879. 8vo, pp. 217–490, pls. IV, and pp. 9–120, Part I, 1880. From the academy.

Un mot sur quelques cétacés échoués sur les Côtes de la Méditerranée et l'ouest de la France pendant le courant des années 1878 et 1879. Par M. P. J. Van Beneden. (Extr. from Bull. de l'Acad. Roy. de Belgique. 2e Ser., Tome XLIX, No. 2; fev., 1880.) 8vo, pp. 12. From the author.

Descriptions of New Species of Crinoids, from the Kaskaskia group of the Subcarboniferous. By A. G. Wetherby. (Extr. from the Journ. Cincin. Soc. Nat. Hist., Oct., 1879.) 8vo, pp. 7, pl. I.

Descriptions of New Crinoids from the Cincinnati group of the Lower Silurian and the Sub-carboniferous of Kentucky. By A. G. Wetherby. (Extr. Journ. Cin. Soc. Nat. Hist., 1879.) 8vo, pp. 9, pl. I. From the author.

Silurian ichnolites, with definitions of new genera and species. Description of two new species from the Niagara group, and five from the Keokuk group. Note upon the habits of some fossil Annelids. By S. A. Miller, Esq. (Extr. Journ. Cin. Soc. Nat. Hist., 1879.) 8vo, pp. 7, pls. 3. From the author.

Notes on North American Decapoda. By J. S. Kingsley. (Extr. Proc. Bost. Soc. Nat. Hist. XX.) 8vo, pp. 145–160, 1879. From the author.

Neue Amphibien und Reptilien. Bescrieben von Dr. J. G. Fischer. Hamburg. (Sep.-Abdr. aus d. Arch. f. Naturgesch, XXXXVI, Jahrg., I Bd.) 8vo, pp. 215–227, pls. 2. From the author.

Geological Survey of New Jersey. Annual Report of the State Geologist for the year 1879. By Geo. H. Cook. 8vo, pp. 199, with map. From the State geologist.

Supplementary note on the Vertebræ of Ornithopsis Seeley, Eucamerotus Hulke. By J. W. Hulke, Esq., F.R.S., F.G.S. (Ext. Quar. Journ. Geolog. Soc., Feb. 1880.) 8vo, pp. 31–35, pls. 2. From the author.

Vectisaurus valdensis, a new Wealden Dinosaur. By J. W. Hulke, Esq., F.R.S.,

F.G.S. (Extr. Quar. Jour. Geol. Soc., Aug., 1879.) 8vo, pp. 421–424. From the author.

Report on the Mammals and Birds of the general region of the Big Horn river and mountains of Montana Territory. By Chas. E. McChesney, A. A. Surgeon U.S.A. (Ext. from Appendix SS [Report of Lieut. Maguire, Corps of Engineers] of the Annual Report of the Chief of Engineers, 1879.) 8vo, pp. 2371–2395. From the author.

United States Entomological Commission. Bulletin No. 5.—The Chinch Bug, its history, characters and habits and the means of destroying it or counteracting its injuries. By Cyrus Thomas, Ph.D. 8vo, pp, 44, and map. Washington, Government Printing office, 1879. From the Commission.

Quarterly Report of the Kansas State Board of Agriculture for the quarter ending December 31, 1879. By the Secretary. 8vo, pp. 165. From the Board.

The Archives of Comparative Medicine and Surgery. A Quarterly Journal of the Anatomy, Pathology and Therapeutics of the Lower Animals. Edited by Edward C. Spitzka, M.D. Vol. I, No. 1, pp. 56, New York, Jan., 1880. From the editor.

Sea Air and Sea Bathing. By John H. Packard, M.D. 12mo, pp. 120. Philadelphia, Presley Blackiston, 1880. From the publishers.

Notes on the Bartram Oak, Quercus heterophylla Michx. By Isaac C. Martindale. 8vo, pp. 24. Camden, 1880. From the author.

Studies from the Biological Laboratory of Johns Hopkins University, Baltimore. No. IV. The development of the Oyster. By W. K. Brooks. 8vo, pp. 81, pls. 10. Acquisition and loss of a food-yolk in Molluscan eggs. By W. K. Brooks. 8vo, pp. 107–116, pl. 1. Baltimore, 1880. From the University.

Geology of Wisconsin. Survey of 1873–1879.. Vol. III. Accompanied by an atlas of maps. T. Chamberlin, Chief Geologist. 8vo, pp. 763, pls. 53. Madison, Wis., 1880. From the State geologist.

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GENERAL NOTES.

BOTANY.

TRANSFORMATION OF ANTHERS INTO OVARIES.—In Gray's Manual, under *Salix livida*, we read, "A transformation of the *anthers into imperfect ovaries* is frequently observable in this species," and in the second edition, was added, "and occasionally in some others." Lately I found a *Salix discolor*, which no doubt is a female, and has on many branches monœcious catkins, the *ovaries fully developed*, some with a few staminate flowers between the pistillate, others with only a few pistillate flowers between many staminate ones, quite irregularly distributed, sometimes all the upper ones and a few in the middle and at the bare pistillate. This would agree (partly) with what Wichura said, in 1847, in a paper on the morphology of the pistil of Salix. He remarks: "The monstrous transformation of the *pistil into stamina* shows that the pistil consists of two laterally situated leaves. The style has two stigmata of which each splits mostly in two. The position of the stigmata is different, they correspond either with the middle line of the carpophyll, and thus are lateral, or correspond with the sutures as in Cruciferæ, and are posterior and anterior." It may be that the transformation takes place in both ways, but in the present case I am sure that the plant is originally pistillate.

With what Wichura said about the position of the stigmata, I cannot agree. First, the carpophylls are not lateral, but anterior and posterior, corresponding the one with the gland, the other with the scale; this I think is generally known, though I find it nowhere mentioned, and then I found in all our species the stigmata, corresponding with the carpophylls, and even in those European species *(S. caprea, aurita, cinerea, viminalis)*, in which, according to Wichura, the stigmata correspond with the suture. The ovary of the Cruciferæ has a septum and the stigmata correspond with the placentæ, which run along the sutures. The ovary of Salix has no septum, the stigmata correspond with the placentæ, which are in the middle of the base of the carpophylls—*Fred. Brendel.*

Additions to a Historical Sketch of Botany.—I send you some additional notes to my historical sketch, which appeared in the December and January numbers of the Naturalist, with some corrections suggested by Dr. Engelmann. Dr. G. Engelmann, was born in February, 1809, and went to Missouri in 1832, residing in St. Louis since 1835. He knew Jos. Frank, in Heidelberg, 1827, where he was known under the nickname "plant hyena!" In 1835, Engelmann collected in Arkansas, and he thinks that Beyrich went there with Gen. Leavenworth. In Texas, Berlandier collected in the year 1834. Lindheimer came to West Texas in 1844. From Dr. Parry I learn that he published in Owen's Report, 1852, pages 606-622, a list of Iowa and Minnesota Plants collected in 1848.

Dr. Thos. Coulter's collections made in California in 1831–32, were published in the Journal of the Royal Geographical Society, Vol X. page 59: Notes on Upper California, communicated by Dr. Thomas Coulter, read March 9th, 1835, contains a map and itinerary. He met Douglas at Monterey, Nov., 1831, made a trip across the Colorado desert to the junction of the Gila and Colorado rivers, in spring of 1832. On his return to England, he was appointed Curator of the Herbarium, at Dublin, and died in 1840. This note I owe to Dr. Parry.—*Fred. Brendel.*

The Fly-trap, its First Discovery.—The fly-trap *(Dionæa muscipula)* has lately been much spoken of; so it will be interesting to learn when this plant was first made known. John Ellis, (1711–1776), a London merchant, received in 1769, from Philadelphia, the plant and described it with drawings in "Directions for bringing over seeds and plants from the East Indies and other distant countries, in a state of vegetation, to which is added the figure and botanical description of *Dionæa muscipula*," London, 1770. The same gentleman published in 1771, "Copies of two letters to Dr. Linnæus and Mr. W. Aiton," containing descriptions and drawings of two other North American plants, *Illitium floridanum* and *Gordonia lasianthus.—Fred. Brendel.*

ARENARIA GRŒNLANDICA NEAR MIDDLETOWN, CONN.—I would also report *Arenaria grœnlandica* Spring., as occurring in this vicinity. I have observed it in two places, both summits of rocks. It appears to grow in the very shallow bed of soil that collects on exposed rocky knobs, and is very abundant in these two narrow limits. The flowers are larger and the plants more luxuriant than in specimens from Greenland that I have seen, yet its identity is undoubted, and on the authority of Professors Gray and Eaton. The rocks on which it is found, occur on hills that rise two hundred feet or thereabouts, above the general level of the surrounding country.—*Henry L. Osborn, Wesleyan University.*

BOTANICAL NOTES.—In the *Botanical Gazette*, for April, Mr. I. C. Martindale discusses the germination and growth of the parasite, *Orabanche ramosa*, and M. E. Jones records his observations on remarkable forms of *Triticum repens.*——*Grevillea* for March notices New York fungi.——According to Prillieux, the roots of *Hartwegia ramosa* are negatively heliotropic, lengthening both by day and by night, due as he thinks, to the increased amount of growth on the illuminated sides. We also learn from the *Journal* of the Royal Microscopical Society for April, that a luminous fungus has been reported from the Andaman Islands; it is an agaric of small size, but exceeding in brilliancy anything which has hitherto been observed.——The influence of light on the movements of Desmids, has been investigated by E. Stahl, who finds that the cell of Closterium shows a tendency to place its longer axis in the direction of the rays of light, and that there is also a polarity between the two halves of the cell, in consequence of which, one is attracted towards, and the other driven away from the source of light. There is also a slow movement of the individual along the bottom in the direction of the source of light. When the light is very intense, the conditions are reversed, and the cell places itself with its longer axis at right-angles to the direction of the light. Observations by Göbel on Micrasterias and on the influence of light on the spores of low plants are noticed.——Ferdinand Lindheimer, the collector of "Plantæ Lindheimerianæ," lately died at New Braunfels, Mexico, aged about 78.——In a pamphlet printed at Camden, N. J., and entitled "Notes on the Bartram Oak, *Quercus heterophyela* Michx.," Mr. I. C. Martindale enters into an elaborate discussion of the reasons why the foregoing name given by Michaux should be maintained, and its rank as a good species established. The immediate occasion for the essay, was the discovery of some trees near Mount Holly.

ZOÖLOGY.[1]

THE ISLAND OF REIL.—Dr. Spitzka has advanced reasons for denying the current theory that the Island of Reil is the locality

[1] The departments of Ornithology and Mammalogy are conducted by Dr. ELLIOTT COUES, U. S. A.

of the function of speech. He find it to be very large in the hippopotamus, relatively three times as large as in the horse, while it is very much reduced in the seal. On the other hand, in the porpoise it is relatively larger and considerably more convoluted than in man. It differs from that of man in being highest behind and tapering forwards; in man it is higher in front and tapers backwards.

On the Internal Structure of the Brain of Limulus polyphemus.[1]—Several years ago I attempted to study the brain of the horse shoe crab *(Limulus polyphemus)*, and had it sliced into a large number of sections. Owing to interruptions these sections, made from unstained alcoholic specimens, were not examined: during the past winter I have been able with the aid of Mr. N. N. Mason, of Providence, to take up the study afresh. Mr. Mason has kindly made sections, both transverse and horizontal, stained with osmic acid; also sections of the brain of the supra-œsophageal ganglion of the lobster, stained with picro-carmine, for comparison. The following results, then, are based on over two hundred sections of the supra-œsophageal ganglion of Limulus, but more especially on one brain, which was cut by Mr. Mason into fifty-six sections, from $\frac{1}{1000}$ to $\frac{1}{500}$ of an inch in thickness, and another cut into over forty. The examination of a few sections of the lobster's brain, enabled me to comprehend more readily the recent papers of Dietl, Newton and Krieger on the brain of the Decapodous Crustacea and of the insects, and thus give me a standard of comparison by which to study the topography and histology of the brain of Limulus.

General Anatomy of the Brain.—The singular relations of the central nervous system of the adult Limulus, have been fully described and beautifully illustrated by A. Milne Edwards, and Dr. Dohrn and myself have described its general anatomy in the larval stage. The central nervous system of Limulus consists of an œsophageal collar, mostly made up of six pairs of ganglia, from which nerves are distributed to the six pairs of foot-jaws (gnathopods), while the ring is closed or completed in front by the brain, or what corresponds to the supra-œsophageal ganglion of normal Crustacea and insects. In these Arthropoda, the brain is situated in the upper part of the head in a plane parallel to but quite removed from that of the rest of the ganglionic chain; in Limulus, however, the brain is situated directly in front of and on the same plane with the rest of the central nervous system. Milne Edwards states that the œsophageal ring, as well as the posterior part of the nervous system, is enveloped by an arterial coat; he also states that the brain and nerves are enveloped in a similar arterial coat, but this we have failed to find; the brain is protected by a thick membrane ("perineurium" of Krieger) formed of fibrous connective tissue, and the nerves are protected

[1]Read at the meeting of the National Academy of Sciences, held at Washington, April 21, 1880.

by a continuation of this membrane, as several longitudinal sections of these nerves have taught us. The brain in a Limulus ten inches long, exclusive of the caudal spine, is about five or six millimetres in diameter; it is flattened slightly above, and on the upper side has a shallow median furrow, indicating that it is a double ganglion. Three pairs of nerves and a median unpaired one (the ocellar), arise from the upper third of the anterior face of the brain. The two optic nerves are the largest ones, arising one on each side of the median furrow, so that the fifth to fifteenth sections made by the microtome, pass through them. Next below (from above downwards) is the origin of the ocellar nerve, which, as described by A. Milne Edwards, is single, arising from the median line; on each side and in nearly the same plane, arise two tegumental nerves, and directly below a second pair of larger nerves (fronto-inferior tegumental) descend vertically. No nerves arise from the lower half or two-thirds of the brain, which is smooth and rounded, with no median furrow underneath. It will thus be seen, that, as stated by A. Milne Edwards, there are no antennal nerves, such as exist as a rule in Arthropods except Arachnida. This we have proved in the same manner as Milne Edwards, by laying open the arterial coat or modified neurilemma, which reaches to the posterior end of the brain, and seeing that the fibres of the nerves sent to the first pair of legs originate quite independently of the brain itself.

Internal Structure and Histology of the Brain.—Transverse sections of the brain throw but little light on the topography, as the nerve fibres extend horizontally, the nerves being sent out horizontally and from the anterior end only of the brain; hence the examination of nearly two hundred sections threw little light on the topography, and considerable time was spent in a vain and baffling attempt at understanding the geography of this ganglion.

The study of two brains each sliced horizontally into about fifty sections, carefully mounted by Mr. Mason in consecutive order, finally enabled me to arrive at a tolerably complete idea of the relations of parts, so that I could mentally construct a model of the brain of Limulus, and compare it with the normal Arthropod brain.

The histological elements of the brain of Limulus are three in number. 1. Large ganglion cells, filled densely with granules and with a well-defined nucleus similarly filled and with a granular nucleolus. These cells may be crowded or loose, with the granules fewer in number, and with loose, thick cell-walls; they terminate in large fibres which sub-divide. 2. Similar cells, but smaller with less protoplasm, and like those in the lobster's brain. 3. Nerve fibres; these, like the large sized ganglion cells, from which they originate, are stained tawny yellowish-brown with osmic acid. These fibres are large, coarse, their granular contents very homogeneous, and they closely resemble the nerve fibres distributed to the compound and simple eyes. Certain fibres near the origin of the optic nerves, are distinctly nucleated

at intervals. 4. Rounded masses, consisting wholly of nuclei, enclosed in a network of fibres, which stain dark brown with osmic acid; these bodies form the larger part of the substance of the brain, while staining dark brown with osmic acid; in unstained alcoholic sections these masses are dark or grayish, the substance or fibres enclosing them, being whitish, by transmitted light. The brain is enveloped by a thick perineurium, formed of a fibrous tissue, and some (probably) elastic tissue, which occasionally penetrates into the brain-substance between the white rounded fungoid masses, forming the mesh-work surrounding them. The general topography of the brain of Limulus is on a simple plan compared with that of Decapodous Crustacea and insects. The brain is mostly composed of large irregular rounded masses or balls of nuclei, with a thick fungoid or ruffle-like periphery, formed by a layer of secondary smaller rounded granular masses. The center of the primary masses is stained paler brown by osmic acid. These masses are often seen in section, rounded, but more often are irregular, not closed spheroids; these fungoid or nucleogenous bodies extend through the brain like ruffles. The lower half or two-thirds of the entire brain is apparently filled with these nucleogenous bodies, as we may provisionally designate them. In the upper third of the brain, whence the nerves originate, the larger ganglionic cells and the nerve fibres appear, and preserve a definite topographical relation to the entire brain. The nucleogenous bodies are confined at the top to each side of the brain; the central and hinder regions are filled with the large ganglionic cells, mixed with numerous much smaller ones, and the mass of nerve fibres which spring from them, becomes larger from the upper third to the top of the brain where the optic fibres originate. Opposite the beginning of the optic nerves, these large nerve fibres are seen directed towards the origin of the nerves as if they were the roots, as they undoubtedly are. In the section passing through the ocellar nerve and the tegumentary nerves on each side, the fungoid masses are situated in the front of the brain; but they disappear from the front higher up at the origin of the optic nerves, and occupy a much more restricted area on the sides of the brain. Thus the tract of nerve fibres on either side of the brain is irregularly wedge-shaped, the apex situated near the centre of each hemisphere, and the base spreading out on the top, thus crowding to the outer walls the nucleogenous bodies.

It would thus appear as if the lower half of the brain were in an indifferent state,[1] and that the dynamic part were confined to the upper third, the region giving origin to the nerves of sensation.

[1] This area, made up of granules and nuclei, seems really to be connective tissue, and to represent the connective tissue in which the ganglia of the embryo of the young larva are embedded. There seems no reason why the brain should not be partly formed from connective tissue as much as the remaining ganglia, as we have seen them to be in different sections of different ganglia, all or nearly all except the supra-œsophageal one.

The asymmetry of the brain is remarkable; the large ganglionic cells are most abundant in the center behind the middle and from there to the posterior side of the brain; a median line is slightly indicated by the arrangement of the fungoid masses. The tract composed of large nerve fibres with scattered ganglionic cells on the left side is very much more extensive than on the right.

Comparison with the brain of other Arthropods.—So wholly unlike in its form, the want of antennal nerves, and internal structure, is the supra-œsophageal ganglion, or "brain," of Limulus to that of insects and the higher Crustacea, that it is very difficult to find any points of comparison.

Histologically, judging by my specimens of the brain of the lobster which are stained with carmine, the brain of Limulus agrees with that of other Arthropods in having similar large ganglion-cells; the smaller ganglion-cells, so abundant in the brains of insects and Crustacea, are wanting in Limulus. There are, in Limulus, no *ballen-substanz*-masses homologous with those of the other Arthropods nor any "mush-room" bodies.

Topographically the internal structure of the brain of Limulus is constructed on a wholly different type from that of any other Arthropodous type known, so much so that it seems useless to attempt to homologize the different regions in the two types of brain. The plan is simple in Limulus; much more complex in Arthropods, especially in the brain of the craw-fish, as worked out by Krieger, as in the Decapodous brain there arise two pairs of antennal nerves besides the optic pair, and in external form the two types of brain are entirely unlike. The symmetry of the brain of the crayfish, as of the lobster and insects, is marked throughout, each hemisphere exactly repeating in its internal topography, the structure of the opposite side; the symmetry of that of Limulus is obscure and imperfect.

The Food of Birds.—Under this title Prof. S. A. Forbes has published in the Transactions of the Illinois State Horticultural Society, a valuable report on the food of the thrushes. In Illinois there are estimated to be three birds to an acre during the six summer months. We make the following extracts: "It is my own opinion that at least two-thirds of the food of birds consists of insects, and that this insect food will average, at the lowest reasonable estimate, twenty insects or insects' eggs per day for each individual of these two-thirds, giving a total for the year, 7200 per acre, or 250,000,000,000 for the State—a number which, placed one to each square inch of surface, would cover an area of 40,000 acres.

"Careful estimates of the average number of insects per square yard in this State, give us at farthest 10,000 per acre for our whole area. On this basis, if the operations of the birds were to be suspended, the rate of increase of these insect hosts would be accelerated about seventy per cent., and their numbers, instead of

remaining year by year at the present average figure, would be increased over two-thirds each year. Any one familiar with geometrical ratios will understand the inevitable result. In the second year we should find these pests nearly three times as numerous as now, and with that astounding acceleration of increase characteristic of geometrical progression, they would multiply until in about twelve years we should have the entire State carpeted with insects, one to the square inch over our whole territory. I have so arranged this computation as to exclude the insoluble question of the relative value of birds and predaceous or parasitic insects, unless we suppose that birds eat an undue *proportion* of beneficial species.

"Take another view of this matter. According to the computation of Mr. Walsh, the average damage done by insects in Illinois amounts to twenty millions dollars a year. Large figures certainly; but when we find that this means only about fifty-six cents an acre, we begin to see their probability. Few intelligent farmers or gardeners would refuse an offer to insure complete protection, year after year, against insects of all sorts, for twenty-five cents an acre per annum, and we will, therefore, place the damage at one-half the above amount—ten million dollars per annum.

"Suppose that, as a consequence of this investigation, we are able to take measures which shall result in the increase, by so much as one per cent. of the efficacy of birds as an insect-police, the effect would be a diminution of the above injury to the amount of sixty-six thousand dollars per annum, equivalent to the addition of over one and a-half million dollars to the permanent value of our property; or if, as is in fact a most moderate estimate, we should succeed in increasing the efficiency of birds five per cent., we should thereby add eight and one-fourth millions dollars to the permanent wealth of the State, provided, as before, that birds do not eat unduly of beneficial species.

"These figures will be at once rejected by most naturalists as absurdly low. The young robin of Prof. Treadwell (a bird whose fame has extended over both hemispheres) required not less than sixty earth-worms a day, equivalent to at least two hundred and fifty average insects, to keep it alive. A pair of European jays have been found, Dr. Brewer informs us, to feed their brood half a million caterpillars in a season, and to eat a million of the eggs in the winter.[1]

"Compared with these numbers, my 7500 insects a year seem certainly many times too few, and similar criticisms might very probably be made on other items of the estimate. I prefer, however, to put these matters with a moderation which will command

[1] A young mocking-bird (*Mimus polyglottus*), raised from the nest by my nephew, Robert Forbes, ate about 240 red-legged grasshoppers daily, equivalent to at least 480 average insects.

general assent, especially as we see that the importance of the subject does not require exaggeration. Of course the individual farmer or gardener could, by inteligent and careful management, if he knew just what to do, increase the value of his own birds far beyond his individual share of the above-mentioned general aggregate.

"It is thus made probable that the birds intervene continuously between us and the complete destruction of our most important industries, the irretrievable financial ruin of nearly our whole population."

In conclusion, Mr. Forbes does not, with his present knowledge of economical entomology, attach any great economical value to the thrush family; it appears from his paper that they often eat many insects beneficial to agriculture, particularly ground beetles, still he would treat this question with careful conservatism, and not turn the delicate balance of nature by the extermination or undue breeding of birds.

ZOÖLOGICAL NOTES. — The study of the Siphonophores is advanced by two excellent papers by Mr. W. J. Fewkes, in the Proceedings of the Boston Society of Natural History, one on the structure of *Rhizophysa filiformis*, and the other on the tubes in the larger nectocalyx of *Abyla pentagona*, both Mediterranean forms. Mr. Tewkes has added three Siphonophores to our New England fauna.——To the same number of the Proceedings, Dr. W. K. Brooks contributes a paper on the development of the digestive tract in Mollusks.——Dr. Fritz Müller has discovered a minute Ostracod Crustacean, like Cythere, living in the tree tops of the Bromeliaceæ in Southern Brazil. It appears that these tree tops harbor a host of animals, including the larvæ of insects, even the tadpoles of treefrogs here undergoing their transformations.——The process of respiration in some Crustacea, as Astacus, certain Phyllapoda and Cladocera, has been shown to be in part carried on in the anus; in Leptodora, as shown by Weismann, this is the exclusive mode of respirations. Mr. Hartog now shows (in the *Quarterly Journal of Microscopical Science* for April) that it occurs in several Copepod Crustacea. He also describes how the Hydra swallows its prey. The part played by the tentacles ceases as soon as the mouth comes in contact with the food. The hydra then slowly stretches itself over the food and engulfs it, the tentacles usually turning away from the food.

ANTHROPOLOGY.[1]

A DICTIONARY AND GRAMMAR OF THE AIMARÁ LANGUAGE.—The literature of aboriginal languages has just been favored with an important addition in the shape of a "Dictionary and Grammar of the Aimará language," spoken in the southern portion of Peru, by the Collas (pron. Cólyas) and other tribes. This language is

[1] Edited by Prof. OTIS T. MASON, Columbian College, Washington, D. C.

closely related to the Kechua, or Quichua, and in our century its area is geographically surrounded on all sides by various Kechua dialects. Aimará is a highly developed language, though much less studied by scientists than the Kechua, because this had the prerogative of being the idiom of the ruling portion of the Peruvians and their Incas just previously to the Spanish conquest. Aimará has many grammatic and lexical forms more archaic than Kechua, Chancu, Atacama, and other cognate dialects, and this circumstance renders its study most useful for tracing comparisons. The work alluded to is a republication of the *Vocabulario y Arte de la Lengua Aymara*, conquesto por el *P. Ludovico Bertonio*; Leipzig, Teubner (B. G.), 1879, 8vo., 3 vols. This is a fac-simile edition of Bertonio's work, which was composed as early as 1603, the Dictionary being dated 1612; and the scientist to whom we owe the republication of this rare set of volumes is Mr. Julius Platzmann, favorably known already by his republication of ancient materials for the study of Brazilian languages and by other works of kindred import. The Aimará dictionary, consists of two parts: Spanish-Aimará, and Aimará-Spanish, each forming a separate volume; and gives the meaning of 12,000 or more terms of the language.—*A. S. Gatschet.*

ANTHROPOLOGY IN FRANCE.—The first number of *Revue d'Anthropologie* for 1880, appears promptly with the following contents:

AMEGHINO FLORENTINO.—Armes et instruments de l'homme préhistorique des Pampas, pp. I–12, Pl. I–III.

ROYER, MME. CLEMENCE.—Le Système pileux chez l'homme et dans la série des mammifères; pp. 13–26.

BENZENGUE, DR.—Les Sourds-Muets de Moscow; pp. 27–33.

WAKE, C. STANILAND.—La barbe considérée comme caractère de Races; pp. 34–77.

Révue Critique upon Schliemann's discoveries, by M. Girard de Rialle.

Révue préhistorique, Poland, Germany, Italy, France, Portugal.

Révue des Livres: Roberts's "Manual of Anthropometry," Retzius's "Finnish Crania," Quatrefages and Hamy's "Crania Ethnica."

Révue des Journéaux. French, Italian, English, American, Russian, German.

M. Ameghino, the author of the first article, gave the readers of the *Revieu* a very extended account of the archæology of the pampas, in a former number (II, 2-Serie), prefacing it with a résumé of everything good and bad which he had been able to find upon the great antiquity of man in America. After giving an account of the geological formations containing relics and remains, and describing the implements met with, the author concludes with the following paragraph: "I affirm the contemporaneity of man with the great extinct *edentata* of South America, but I cannot assert that they were Tertiary. I have said that the geological age of the formation is unsolved; my impression is that it is Pliocene Tertiary."

The article of Mme. Royer is designed to show that the human race is descended from a species of animals that never had any hair, in opposition to the generally received theory that our race has lost its hair in time. Following close after this comes Mr. Wake's paper upon the beard, and on pages 170–175, a review, by M. Vars, upon Ecker's "Système pileux et ses anomalies chez l'homme," so that three-fourths of the original communications of the number relate to this external characteristic. After a very extended collation of authorities who have remarked upon the abundance or scarcity of hair upon tribes in all parts of the world, Mr. Wake concludes with Peschel that the beard is a good racial characteristic, and "that there are races upon whom it is developed in all its exhuberance, while there are others in which this distinction appears to be incompletely produced." The author then goes on to seek the causes of this difference. The growth of hair upon the face cannot be attributed to such causes as alimentation and climate. Doubtless these have had their effects; but the true cause must be sought in the sum total of all the influences, moral as well as physical, to which the organism has been subjected. According to this theory, the most general and complete development of the beard should be sought among the races which have been most favorably situated or the longest exposed to the conditions favorable to its production. Beardless races, in this sense, may be compared to children, and those that are bearded to adults. If the beard be a social mark, we seem to be authorized to affirm that bearded races are more nearly related to one another than to those that are beardless.

M. Sauvage presents, on pp. 119–125, a review of parts VII and VIII of De Quatrefages and Hamy's "Crania Ethnica," relating to the Papuans, and Dr. Collineau, from p. 124 to p. 128, draws attention to an inaugural thesis of Dr. G. Calmettes "Upon the medio-frontal, or metopic suture."

The Peabody Museum receives a flattering notice, pp. 145–158, from the pen of Dr. Topinard, in which the author speaks of "the most important museum of anthropology in the United States." The work of the institution from the beginning is very well reviewed.

MR. MACLEAN'S CONTRIBUTIONS TO ARCHÆOLOGY. — We are indebted to the publishers, Robert Clarke & Co., of Cincinnati, for three archæological works by Mr. J. R. Maclean, "A Manual of the Antiquity of Man," eighth edition, 1879; "Mastodon, Mammoth and Man," second edition, 1880; and "The Mound-builders." The first named volume exhibits a great deal of research and patient work on the part of the author, but we are forced, in candor, to offer a few criticisms. The authorities are not carefully selected. The main reliance are Lyell, Figuier, Buchner (Büchner?), Denton, Lubbock, Lartet, Keller, some of them very good, but Rau, Wyman, Evans, De Mortillet, Chantre

and many other later distinguished archæologists and critical historians of the East are not mentioned. The restoration of the Neanderthal man, accredited to Mr. Cushing, is evidently copied from the plaster cast in Ward's Museum, at Rochester. The well established principle of law and science that the prisoner and not the court has the benefit of the doubt, is sometimes inverted, and all doubtful cases are claimed as evidence on the author's side. Upon this point we would utter the caution that to the anthropologist the antiquity or non-antiquity of man, *an und für sich*, are alike indifferent. The truth is above all. Mr. Huxley assured his hearers at the last meeting of the British Association, that the discoveries of M. Boucher de Perthes, in the Somme valley, are not near so ancient as they are claimed to be. At the same meeting Prof. W. Boyd Dawkins read a paper on the geological evidence of the antiquity of man, of which the following is an abstract. "The evidence which geology has to offer as to the antiquity of man is as follows: In the Eocene age there were only families and orders of living Mammalia, and no living genera or species. It is, therefore, hopeless to look for man at this time in the earth's history. In the succeeding or Miocene age, living genera of mammals appear, but still no living species of Mammalia. If the flints found at Thenay, and supposed to prove the existence of Miocene man, be artificial, and be derived from a Miocene stratum, there is, to my mind, an insuperable difficulty in holding them to be the handiwork of man; seeing that no living species of quadruped was then alive, it is to me perfectly incredible that man, the most highly specialized of all, should have been living at that time. The flints shown to me in Paris by Prof. Gaudry, appear to be artificial and partly natural; some of the former from their condition, having been obviously picked up on the surface of the ground. It is less difficult to believe them to have been the work of the large extinct anthropoid apes then living in France, than to view them as the work of man. Nor in the succeeding Pliocene age is the evidence more convincing. As the evidence stands at present there is no proof, on the continent or in this country [England], of man having lived in this part of the world before the middle stage of the Pleistocene age, when most of the living Mammalia were then alive, and when mammoths, rhinoceroses, bisons, horses, Irish elks, lions, hyenas and bears haunted the neighborhood of London, and were swept down by the floods of the Thames as far as Erith and Crayford." In our own country, the occurrence of acorn mortars with crania resembling those of the modern Numas, in the Pliocene tertiary, should be vouched for by a professional archæologist, who removed them with his own hands, before any importance should be attached to them whatever. In the definitions of terms Mr. Maclean is a little unfortunate; as, *Brachycephalic*, a skull whose transverse diameter exceeds the antero-posterior diameter; *Dolico-*

cephalic, a skull whose diameter from the frontal to the occipital bone exceeds the transverse diameter.

The second named volume supplies a real need. It has been favorably reviewed before in these notes; but, since the mastodon and the mammoth are so frequently mentioned in connection with priscan man, a résumé of what is known of them in a handy manual is exceedingly timely and we repeat our praise.

Mr. Maclean's third volume, "The Mound-builders," in its first twelve chapters, reviews what has been written concerning this mysterious race, and gives the author's speculations about their earthworks, arts, civilization and antiquity. The second part, pp. 153–230, is more valuable, with all deference, than all the rest of the author's publications put together. It is a kind of work that we never weary in praising. These chapters will be quoted when all the rest is ignored. It comprises the archæology of Butler county, Ohio, with a map, giving, township by township, a complete report on a county which was one of the most important seats of the Mound-builders. Assisted by an able corps of gentlemen, the attempt was made to search out every enclosure and locate every mound. Some of these surveys are old, but many of them are for the first time made public. The author gives, on pp. 229 and 230, a table of all the private archæological collections in the county, with a classified list of specimens in each.

THE PROTECTION OF ANTIQUITIES.—Upon a motion made by M. Henri Martin, a member of the National Institute, the Anthropological Society of Paris, at its session of December 5, 1878, passed a resolution that a committee be nominated to wait upon the Minister of Public Instruction in order to confer with reference to the preservation of the megalithic monuments of France.

The minister, favoring the proposition, requested the Anthropological Society and the Committee upon Historic Monuments to nominate the members of the Commission. On the 21st of November, 1879, a Sub-committee was added to the Committee upon Historic Monuments with instructions to draw up an inventory of megalithic monuments and erratic inscribed boulders both in France and in Algiers. The committee consists of the following distinguished archæologists: *president*, M. Henri Martin; *vice-presidents*, M. Daubrée, director of the School of Mines, and M. de Mortillet, assistant curator of the Museum of Saint-Germain and professor in the School of Anthropology; *members*, MM. Paul Broca, director of the school of anthropology and general secretary of the Société d'Anthropologie, Emile Cartailhac, editor of "Materiaux pour l'Histoire Primitive de l'Homme," Ernest Chantre, assistant director of the Museum of Natural History, Lyons; Falsan, Leguay, Pomel, Trutat, curator of the Museum of Natural History at Toulouse; Salmond, Sommerard, curator of the Museum of Cluny; *secretary*, M. A. Violet le Duc.

The committee have already commenced operations. France is divided into five sections; M. Henri Martin has charge of Brittany; M. Salmon, of the North-east, M. Chantre, of the South-east; M. Cartailhac, of the South; M. Leguay, of the Center, and M. de Mortillet of the North-west. Algeria is entrusted to M. Pomel. M. Daubrée is specially charged with carved erratic boulders; M. Falsan, with the region of the Alps, and M. Trutat with the Pyrenees.

In accordance with this scheme the inventory of monuments is rapidly progressing, and a series of questions to observers has been issued.

Another Elephant Pipe.—From Prof. J. D. Putnam, secretary of the Davenport Academy of Natural Sciences, we have received photographs of three interesting pipes from Iowa, one of them representing an elephant. Mr. Putnam writes: "The elephant pipe is of especial interest as confirming the genuineness of the one previously found, being made of the same fine sandstone. It was found by the Rev. J. Gass and the Rev. A. Blumer in a mound on the farm of Mr. Hass, two miles east of Grandview, Louisa county, Iowa, in a bed of ashes, beneath a bed of hard burned clay. There were no indications of disturbance in the mound and the pipe was taken out by the gentlemen with their own hands. There is no reasonable doubt of its authenticity.

Anthropological News.—Prof. Morse's Prehistoric researches in Japan are criticised by Mr. Dickins, in *Nature* of Feb. 12th, and the high antiquity of the shell-heaps seriously called in question. "Remains and traces of shell-heaps of quite modern date are common in the provinces of Musashi and Sagami, at a considerable distance from the shore." "I should hesitate to assign a higher antiquity to the Omori heaps than the thirteenth or fourteenth century, and it seems to me probable that they were the work of an Aino race."

Prof. A. R. Grote, of Buffalo, N. Y., has lately published through Asa K. Butts, an "Essay on the Bible Narrative of Creation," being a commentary on Genesis i–ii. Whatever opinion our readers may have as to the weight of authorities quoted, or concerning Prof. Grote's ability to guide us in this most intricate problem, no one will question his scientific attainments or his disposition to treat the subject fairly and his opponents kindly. The gist of the treatise is best given in the author's own words. "If there is one subject which now seems to me more important than another, it is the bearing of our recognition of the process of evolution upon the existing state of our religious creed. It is not that the teachings of Christ are to be rejected, or the morality of the Hebrew Bible to be condemned, but that we are to correct our views as to the way in which existing plants and animals (including man) came to be what they are to-day. For Astron-

omy and Geology the struggle is nearly over. Out of this struggle has sprung the fatal error of believing that our knowledge in these branches does not contradict Genesis, or that a reconciliation is possible. But with biology the struggle is now going on. It is imagined that the six days mean really periods, although from the context the meaning is shown to clearly agree with the words, since the morning and evening are given to limit the term and decide the intention. It cannot, indeed, be too often remembered that people did not write in early times what they did not mean. The study of Genesis, or the origin of things, religion must surrender to the sciences."

Société d'Anthropologie de Paris. Bureau for 1880. President, M. Ploix; vice-presidents, M. Parrot and M. Thulié; secretaries, MM. Bordier, Pozzi and Magitot; curator, M. Topinard; librarian, M. Dureau; treasurer, M. Leguay; publishing committee, MM. de Ranse, Bataillard, Dally.

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MORSE E. S.—Dolmens in Japan. *Pop. Science Month.*, March.

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ST. BONAVENTURE.—L'Origine des Idees. *Ann. d. Philos. Chretienne*, Feb.

SPENCER, HERBERT—Ceremonial Institutions; being Part IV of "The Principles of Sociology" (the first portion of Vol. II).

GEOLOGY AND PALÆONTOLOGY.

ARTIFICIAL FORMATION OF THE DIAMOND.—Great interest has been excited in England during the last few months, by several reports of the artificial manufacture of the diamond. The earlier reports appear to have been founded in error, but success seems

at length to have attended the labors of Mr. Hannay, of Glasgow. The method adopted, is by taking advantage of the affinity displayed by hydrogen for certain metals, especially magnesium, at a very high temperature, forming extremely stable compounds with them. When carbon is by this means set free from a hydrocarbon in presence of a stable compound, containing nitrogen, the whole being near a red heat and under a very high pressure, the carbon is so acted on by the nitrogen compound, that it is obtained in the clear transparent form of the diamond. The carbon thus obtained is as hard as natural diamond, with a specific gravity, ranging as high as 3. 5, scratching all other crystals, and it does not effect polarized light. Mr. Hannay obtained crystals with curved faces belonging to the octohedral form, the diamond being the only substance that crystallizes in this manner. The crystals burn easily on thin platinum foil, over a good blowpipe and leave no residue, and after two days immersion in hydrofluoric acid, they show no signs of dissolving, even when boiled. On heating a splinter in the electric arc, they burn black, a very characteristic reaction of the diamond. At a recent meeting of the Royal Society, where a brief account of Mr. Hannay's discovery was read, Mr. N. S. Maskelyne, F.R.S., the keeper of the mineralogical collection at the British Museum, confirmed the statements that the crystals sent to him by Mr. Hannay, possessed all the properties of the diamond. Mr. Hannay has written to the London papers, to allay the fears of diamond merchants as to a possible heavy fall in the value of diamonds, stating that the cost of the process is so great that it will probably never amount to more than a laboratory experiment. The great difficulty lies in the construction of an inclosing vessel, strong enough to withstand the enormous pressure and high temperature, tubes constructed on the gun-barrel principle, with a wrought iron coil, of only half an inch bore, and four inches external diameter, being torn open in nine cases out of ten.—*A. W. Bennett.*

Corrections of the Geological Maps of Oregon.—In the existing Geological maps of Oregon, the Coast range is represented as composed of Archæan rocks. This is a serious error, Prof. Newberry has already stated (U. S. Pac. R. R. Surveys, Vol. VI, pt. II, p. 29), that the fossils of the range are of an age not older than the Miocene. The unpublished notes of Prof. Condon, formerly State Geologist, state that the back bone of the Coast range consists of argillaceous shales, which contain invertebrate and vertebrate fossils, frequently in concretions. Some of the latter are Physoclystous fishes, with strongly ctenoid scales. To this formation, Dr. Condon gives the name of Astoria shales. Above this is an extensive tertiary deposit, rich in Mollusca, which is usually interrupted by the central elevations of the mountain axis. Prof. Condon refers this to an Upper Miocene age, under the name of the Solen beds. On the flanks of the mountains,

this is overlaid by a pliocene formation, containing some of the fossils of the Equus beds of central Oregon. This is both underlaid and overlaid by basalt, and other volcanic products.

The regions of the John Day river and Blue mountains, furnish sections of the formations of Central Oregon. Above the Loup Fork or Upper Miocene, there is a lava outflow, which has furnished the materials of a later lacustrine formation, which contains many vegetable remains. The material is coarse, and sometimes gravelly, and it is found on the Columbia river, and I think also in the interior basin. Prof. Condon calls this the Dalles group. It is in turn overlaid by the beds of the second great volcanic outflow. Below the Loup Fork follows the Truckee group, so rich in extinct mammalia, and below this a formation of shales. These are composed of fine material, and vary in color, from a white to a pale brown and reddish-brown. They contain vegetable remains in excellent preservation, and undeterminable fishes. The *Taxodium* nearly resembles that from the shales at Osino, Nevada, and on various grounds I suspect that these beds form a part of the "Amyzon group" (this Journal, 1879, p. 332), with the shales of Osino and of the South park of Colorado. Below these, is a system of fine grained, sometimes shaly rocks of delicate, gray buff and greenish colors, containing calamites, which Prof. Condon calls the *Calamite* beds. Their age is undetermined.—*E. D. Cope.*

GEOGRAPHY AND TRAVELS.[1]

Arctic Voyages.—The east coast of Greenland from 69° N. lat. to 65° 18′ has never been laid down until the past summer, when the Danish man-of-war steamer *Ingolf*, reached that part of the coast, sailing from Iceland. Having fixed the positions of some high lands south of Scoresby land, the Danish Hydrographic office has been able partly to fill up this blank on their maps.

It was also found that the ice cold water of the sea bottom, never passes the submarine heights stretching from the Faroe islands to Iceland, and that the depth of the sea decreases considerably in about N. lat. 67°, where it varied from 150 to 200 fathoms, and large icebergs were met with.

Further to the eastward, the temperature of the deeper water rose gradually, while on the surface the rise was sudden—in one case from 1° to 7° C. [33°. 8 to 44°. 6 F.] in an hour; in a distance of five miles the depth of the sea increased from 160 to 505 fathoms and in the Gulf stream to 1005 fathoms.

An immense bank was discovered, running from the north-west coast of Iceland, almost to the Greenland coast, and helping to keep the cold polar streams from the Atlantic.

M. Kornerup, a member of the recent Danish expedition into

[1] Edited by Ellis H. Yarnall, Philadelphia.

the interior of Greenland, mentioned in the NATURALIST for April, states, that in the course of his explorations in the ice fields of the interior, he ascended a hill, the top of which was covered with flowers, and vegetation; several kinds of small animals being also found there.

We learn from the *Proceedings of the Royal Geographical Society*, for February, 1880, that a Norwegian Captain Kjelsen, attained a very high latitude on the Spitzbergen meridian last year, sailing, about the 12th of September, sixty nautical miles northward from the Seven islands. No ice could be seen, nor any ice blink on the northern horizon. The latitude is not given, but could not have been far short of that reached by the Swedes in 1868, 81° 42′ N., and may possibly have exceeded it.

While the Arctic sea was thus unusually open to the north of Novaya Zemlya and Spitzbergen, the Sea of Kara was full of ice throughout the season, and only one vessel finally succeded in penetrating it, and made the voyage out and back from Bremen to Yeniseisk.

The Russian government established, in 1878, Karmahul harbor [72° 30′ N. lat.] in Möller bay, Novaya Zemlya, a station for the relief of ship-wrecked sailors and also directed the taking of a series of meteorological observations for a whole year. Lieut. Tiaguine was placed in command, and with his wife, children, three servants and five Samoyede families, passed the winter of 1878–9 on the island. The autumn was rainy and cold. The average temperature was about 39° .20 F. The first frost was on September 26, the first snow, on September 28, and the sea froze on October 10. Drift ice was seen in the middle of October, and on November 13, the harbor and small bays were frozen over. Möller bay, however, did not freeze during the whole winter, except among the islands. The first thaw happened in the middle of May, and by June 14 the small islands were covered with verdure, but the harbor was not clear of ice until July 16. The mean temperatures were November, 49° .64 (F.) February, 0° .04, March, 10° .76. During the five winter months, the mean temperature was 10° .04. The wind varied considerably, sometimes rising to violent storms from E. S. E. A small quantity of snow fell, but was blown into deep drifts. Three of the Samoyedes died from scurvy, having refused to take exercise, or follow Lieut. Tiaguine's recommendations. The rest returned well to Archangel in August, 1879. Lieut. Tiaguine considers wintering in Novaya Zemlya quite practicable, but a supply of provisions is absolutely necessary, as it seems impossible to obtain by hunting, anything like a sufficient quantity of animal food during the winter.

A New edition of the "Narrative of the North Polar Expedition,"—the voyage of the *Polaris*, under Capt. Hall, has been authorized by Congress, provided the number of subscribers shall reach 500. Orders may be sent to Mr. A. F. Childs, Government

Printing Office, accompanied by the price of the volume, $2. This is likely to be the last opportunity of obtaining the volume.

It is also to be hoped that another edition of the narrative of the second Arctic Expedition made by Capt. Hall [reviewed in our last number], to be sold at cost price, will also be ordered. The demand for it has been very great, and the first edition was very quickly exhausted.

An Italian Antarctic Expedition is proposed by Lieut. Bove, who was one of the officers under Nordenskiöld on the *Vega*. It is to sail in the spring of 1881 and touch at Monte Video, Terra del Fuego, Falkland and South Shetland islands, and proceeding in a south westwardly direction, commence explorations, expecting to be engaged for two winters in the Antarctic region, and return by way of Hobart Town. The expenses are estimated at 600,000 lire.

THE HOWGATE ARCTIC EXPEDITION.—The following bill has passed the U. S. House of Representatives, and been favorably reported to the Senate:

A BILL to authorize and equip an expedition to the Arctic Seas.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States be, and he hereby is, authorized to establish a temporary station at some point north of the eighty-first degree of north latitude, on or near the shore of Lady Franklin Bay, for the purposes of scientific observation and exploration, and to develop or discover new whaling-grounds; to detail such officers or other persons of the public service to take part in the same as may be necessary, and who are willing to enlist for such purpose, not exceeding fifty in number, and to use any public vessel or vessels that may be suitable for the purpose of transporting the members of said station and their necessary supplies, and for such other duty in connection with said station as may be required from time to time: *Provided*, That the President of the United States is authorized to accept from H. W. Howgate, and fit out for the purposes of this expedition, the steamship *Gulnare*, which vessel shall be returned to its owner when the objects of the expedition shall have been accomplished, or when, in the opinion of the President, its services are no longer required: *Provided further*, That the United States shall not be liable to any claim for compensation in case of loss, damage, or deterioration of said vessel from any cause, or in any manner whatever, nor be liable to any demand for the use or risk of said vessel.

We learn from Capt. W. H. Howgate, that the steamer *Gulnare* is of about 230 tons burden, and will have a crew of fifteen, officers and men all told. The expeditionary party which will be left at the station while the vessel returns to the United States, will consist of twenty-five men, including the necessary scientific corps.

It is hoped that the exploring party can be landed at some point on or near the shore of Lady Franklin Bay in time for the *Gulnare* to return home this season. The *Gulnare* is being fitted up for ice navigation under the superintendence of Capt. Chester, who was with Hall in the *Polaris*. A house of wood, double boarded, 21 x 68 feet, modeled after those used by the Hudson's Bay Company, is being constructed for the men to winter in on the shores of Discovery harbor. A steam launch will probably form part of the expedition. The purposes and intentions of this new attempt at Polar discovery are given in the report of the House Committee as follows:

"In making this report the committee respectfully state and report that the object of the bill, as is shown by its terms, is to authorize a temporary station to be selected within the Arctic circle, for the purpose of making scientific discoveries, explorations, and observations, obtaining all possible facts and knowledge in relation to the magnetic currents of the earth, the influence of ice-floes therefrom upon the winds and seasons, and upon the currents of the ocean, as well as other matters incidental thereto, developing and discovering at the same time other and new whale-fisheries, now so material in many respects to this country. It is, again, the object of this bill that this expedition, having such scientific observations in view, shall be regularly made for a series of years, under such restrictions of military discipline as will insure regularity and accuracy, and give the fullest possible return for the necessary expenditure; and, again, in view of the fact that either the governments directly, or scientific corps under their authority, of Germany, Holland, Norway, Sweden, Austria, Denmark, and Russia, have concurrently agreed to establish similar stations, with like object, during the year 1880, it is believed that the interests and policy of our people concur in demanding that the United States should coöperate in the grand efforts to be thus made in the solution of the mysteries and secrets of the North Polar seas, upon which, in the opinion of scientists, depends so much that affects the health and wealth of the human race."

MICROSCOPY.[1]

Adulterations of Food.—Adulterations or impurities of food may be divided into three classes. First, deleterious adulterations; these are such as are directly injurious to health, such as red lead in cayenne pepper, chromate of lead in mustard, or water in milk. The second class, and by far the largest, is what may be called fraudulent adulterations. These injure the pocket rather than the health. This class does not properly come under the notice of the health officer, but is a fraud upon the general public, which should be taken notice of by mercantile associations. This

[1] This department is edited by Dr. R. H. Ward, Troy, N. Y.

class may be illustrated by such articles as flour in mustard, chicory in coffee and terra alba in cream of tartar. The third class is what may be called accidental. In many instances of this class, it is the duty of the health officer to interfere and confiscate the goods, but the simple deprivation of the articles is generally sufficient punishment. In other cases, in this class, the presence of the impurity arises from methods of manufacture, and if it does not exceed a certain limited amount it may be neglected, and is generally neglected in trade. For instance, cream of tartar generally contains tartrate of calcium; if this does not exceed six or seven per cent. the article passes as pure. If it runs much higher the article is rejected or passes as a low grade with a reduction in price. Belonging to the same class is the small amount of sand oftentimes found in Cuban sugars, and in general all the impurities in our every-day food which are present, not from design, but from some imperfection in the process of manufacture.

The first operation in our search for adulteration is to make ourselves thoroughly acquainted with the genuine article, and in order to make ourselves acquainted it is not sufficient to merely read the accounts we may find in the books, but we must take the articles to our laboratories and submit them to every test that we can devise. Perhaps the most difficult branch of adulteration that the chemist has to deal with is the sophistication of ground articles. So long as the article is in its natural state but little trouble is experienced; we can readily detect any changes made in it, but when ground we have no resource except the microscope or chemical tests. Many substances which contain starch grains can be readily recognized by the microscope. Flour in mustard at once shows. The various arrowroots are readily distinguished by this means. A few weeks ago I had occasion to examine flour that was suspected of adulteration. Washing with water served to show that one portion was much heavier than the remainder. Microscopic tests at once showed that this heavier portion was rice flour. In this case the usual order of adulteration was reversed, and a more expensive article was added to a cheaper one in order to raise the grade of the whole. Much has been said and written in regard to the adulteration of coffee, but so far as I know no one has yet found in the coffee any article more injurious than the coffee itself. Chicory may be readily distinguished from coffee by the fact that when the ground article is thrown into water, if chicory, peas, rye or Indian corn are present, they rapidly sink to the bottom, while the coffee floats. The adulterations also quickly impart to cold water a brown color, while coffee colors it but slowly. Cream of tartar is, perhaps, the substance next on the list at present which gives us the most trouble. The common adulterations of this article are rice flour, which is easily detected by the microscope and by turning blue when treated with tincture of iodine. Terra alba or

gypsum, which is but sparingly soluble in hot water, but which may be dissolved with muriatic acid; when this is present the solution gives a precipitate with chloride of barium. It is also readily recognized by the microscope when polarized light is used. Tartrate of calcium—this is almost insoluble in boiling water—is soluble easily in hydrochloric acid, and gives a precipitate with ammonia and oxalate of ammonia. The quantity of this must exceed seven or eight per cent. before it can be reckoned as an adulterant. Milk is another subject about which the controversy seems to be needless. The list of adulterations found in the books is a long one, but when thoroughly investigated, it seems to narrow down to about two or three. Water is added in considerable quantities, a little burnt sugar is then added to bring up the color. One or two other substances are sometimes classed as adulterants, the use of which can hardly be condemned. In hot weather many of the milkmen add a little baking powder or bicarbonate of soda to the milk, or a little salt; both these substances tend to prevent the milk becoming sour and coagulating. A trace of chalk is also sometimes used for the same purpose. The fraud most extensively practiced in this vicinity at the present time is the sale of skimmed for whole milk. This fraud can easily be detected by the microscope. Milk that has been skimmed is comparatively free from large fat globules. Sugar as sold here is perhaps as pure as sold at any place in the world. Candy, however, is like all manufactured articles, to be looked upon with suspicion. The flavoring matters are rarely what they purport to be, and in some cases are violent poisons. At the present time the article is made largely of glucose, which is manufactured from corn starch. I see no objection to the use of this, provided it is well made and purified. In the examination of meat the inspector has to rely largely on his senses and his familiarity with the genuine article. The microscope comes in play here to detect certain diseased conditions, and to show encysted parasites, such as *Trichina spiralis*.

Avoid hasty conclusions about adulteration. Persons often take a look through their microscopes at articles of food and rush into print their discoveries, when a few hours' patient investigation of genuine articles about which there could be no doubt, will serve to show them that they were mistaken in their suppositions. Young students fresh from college are apt to find things very much worse than those who have studied the subject for years. But I would not for this reason discourage a full investigation of the subject. The more thoroughly we become acquainted with it, the better able we will be to detect and secure the punishment of fraud where it does occur.—*Read before the Boston Microscopical Society, by S. P. Sharples, State Assayer of Massachusetts.*

A NEW "GROWING SLIDE" FOR MINUTE ORGANISMS. — Mr. Julien Deby, vice-president of the Belgian Microscopical Society,

submitted to the Queckett Club a description of a newly contrived growing slide which is easily made, and which answers its purpose remarkably well. A glass ring is cemented to a 3 × 1 slip, forming a cell one-eighth of an inch deep and three-quarters of an inch in diameter, as if for mounting an object. A small hole is bored through the slip inside of this cell, and near its edge. The objects (as Bacteria, &c.) are placed in a very minute drop of water upon a thin cover-glass which is then inverted upon the cell and attached to its ring by a little lard, the drop with its objects being within the cell but touching only the cover-glass. Another 3 × 1 slip is then placed below the perforated one and attached to it by india rubber bands passed around the ends. One end of the whole combination is then placed in a little water which spreads between the slips by capillary attraction, and by evaporation passes through the hole into the cell, and prevents the drop of water at the top of the cell from drying up. A small fraction of a drop of water may thus be maintained without serious loss for weeks together, the objects it contains being meanwhile in a most favorable position for microscopical study. Mr. T. C. White reminded the members that it was easy to drill the hole through the glass slip by using a steel drill ground to a three-sided point and well hardened by heating and then dipping in turpentine. The hole should be bored half way through from one side, and then from the other, and then cleared out with a small file.

Collecting and Mounting Spiders' Webs.—In an interesting paper on this subject read before the Queckett Club, Mr. Geo. Hind states "that he found it unsatisfactory to take the web directly upon the glass slide, it being difficult to secure the desired portion of the web or to free it from the moisture that is present. He prefers to take pieces of wire about twelve inches long, bent into rectangular frames and gummed to secure adhesion of the web. This frame is carefully brought up against the selected portion of the web, which adheres, and the surrounding portion of web is cut away with a pair of scissors. The frame with its adherent web is then placed in a racked box until the web and any insects it may contain are perfectly dry. When ready for mounting, a thin paper cell is fastened to a glass slip, and its upper surface slightly gummed and brought in contact with the web. The surrounding web is cut away with scissors, another thin paper cell is placed above the first, the web being thus left stretched between them, and a cover-glass affixed in the usual way. In this manner may be obtained many small insects that are with difficulty found in any other way. Finding that several spiders that were kept in confinement in order to obtain good threads for mounting, would not at first spin threads, and being unwilling to wait for them to commence, the author occasionally shook the spider to make it spin stray threads, and in so doing

discovered the reason why the web is plain in some parts and beaded in others, the radial threads being continuous while those which form the concentric circles are beautifully beaded. "When emitted by the spider, the web is in a very viscid state, and I noticed that when the whole weight of the spider was upon the web, and the thread was fastened off quickly, it was not beaded; but when by some chance the spider had slightly relaxed the tension before fastening it off, I observed a slight quiver pass through the thread, and upon examining it with a magnifier, I found that it was beaded from end to end.

Wood-fibres for Paper-making.—Mr. Galloway C. Morris has contributed to the Postal Club a special box of wood fibres prepared in a form suitable for paper pulp. They were prepared by boiling under pressure in caustic alkali in order to destroy everything but the cellulose, and the peculiar wood fibres of the plants selected are completely isolated and well shown. Not only do the preparations show soft woods such as poplar, pine and buckwheat, but also such harder woods as hickory, rosewood and ebony.

Cleaning Cover-glasses.—Dr. R. U. Piper, of Chicago, has invented a very simple method of cleaning cover-glasses without breaking them. Upon a glass plate 2 × 3 inches are cemented, in the form of a V, two thin strips of glass. A cover-glass may be laid upon the glass plate inside of the V and cleaned by rubbing freely, being held in position from slipping by the sides of the V.

Spodumene.—An excellent paper on this subject, reprinted from the Annals of the New York Academy of Sciences, by Alexis A. Julien, contains interesting discussions of the microscopical characteristics of this mineral and its alterations. They can be satisfactorily studied only in connection with the accompanying plate.

The Microscopical Appearances of the Valves of Diatoms. —In a paper on this subject, reprinted from the Annals of the Belgian Microscopical Society, Mr. Julien Deby, vice-president of the society, gives a very interesting study, accompanied by diagrammatic illustrations, of the proper interpretation, in respect to their physical structure, of the microscopical appearances of some of the more puzzling species of diatoms.

The American Journal of Microscopy. — This monthly, whose publication was temporarily delayed during a considerable portion of last year, has now been brought up to date, and the current numbers are being issued regularly and promptly. Last year's numbers, Vol. IV, have been issued as a bound volume, and constitute, at a slight cost, a book full of interesting glimpses of the daily progress of this branch of science.

SCIENTIFIC NEWS.

— The eleventh number of the Bibliographical Contribution of the Library of Harvard University is on the entomological libraries of the United States, by Mr. S. H. Scudder. The largest is that of the Zoölogical Museum at Cambridge, numbering about 2000 volumes and 3000 pamphlets; the Public Library of Boston contains about 650 volumes and 75 pamphlets, that of the Boston Society of Natural History 900 volumes and nearly 550 pamphlets; that of the American Entomological Society at Philadelphia, 1728 volumes and 336 pamphlets; of the Academy of Natural Sciences at Philadelphia, 956 volumes and 554 pamphlets; of private libraries, that of Mr. Scudder comprises 765 volumes and very nearly 2000 pamphlets; Prof. C. V. Riley's about 700 volumes and about 3000 pamphlets; Dr. J. L. LeConte's about 700 volumes and 800 pamphlets; Prof. A. S. Packard's 470 volumes and 550 pamphlets; and Mr. P. R. Uhler's contains over 300 volumes and about 500 pamphlets; while the library of the Peabody Institute at Baltimore, contains 800 volumes and 200 pamphlets. Important libraries of entomological works are possessed by the Buffalo Society of Natural Sciences; the Congressional Library, the Entomological Division of the Agricultural Department, at Washington, the Astor Library, and that of Yale College.

— Jacob Stauffer died in Lancaster, Penna., on March 22d, in the seventy-second year of his age. Mr. Stauffer was a naturalist by instinct, and a man of various natural gifts. He was born in Lancaster county, Penna., and received a common school education. He followed various avocations, but devoted a good deal of time to natural history. He was a good local botanist, and early made some important observations on the parasitism of certain species of our native *Scrophulariaceæ*. He discovered several new species of fishes; one a percoid, the *Etheostoma peltatum* Stauffer; another, the singular blind catfish, *Gronias nigrilabris*. His most extended studies were made in entomology, and his innumerable observations on the habits and metamorphoses of insects were recorded in large manuscript books, illustrated with numerous colored drawings executed by himself. It is to be hoped that these may be in some way rendered available to science by some competent entomologist. Mr. Stauffer was a man of much native refinement, and both amiable in his manners and just in his dealings. His name is recorded in the fauna of Mexico in a species of tree-frog, *Hyla staufferi* Cope.

— The Diary of a Bird, freely translated into human language, by H. D. Minot, published by A. Williams & Co., Boston, 1880, is very well done. The complaints that avian flesh is heir to from the attacks of their historian, if not always true friend, man, culminate in the following statistics on page 33: In the State of

Massachusetts alone there are annually destroyed not less than 50,000 partridges, 30,000 woodcock, 15,000 quail, and 5000 snipe, or 100,000 game birds, while in the same State 250,000 wild birds (counting their eggs) are placed *hors du combat.* Mr. Minot says that we must not be surprised if no less than 1,000,000,000 wild birds are annually destroyed in the United States. *Hinc illæ lachymæ*, so far as regards the diary of this bird, which if it may seem in some degree to stay this unseemly carnage has not been written in vain.

— One of the reports of the *Challenger* Expedition has at last been issued, and will form the specimen to which the other reporters will model their memoirs. The work will make altogether some fourteen or fifteen quarto volumes, illustrated by lithographed plates. The section intrusted to the care of Prof. Haeckel—the Radiolaria—proves to be of greater importance than was suspected, for the reporter finds himself called upon to deal with more than 2000 new species, and to constitute a new order of hitherto unclassified forms. Only 750 copies of the work are to be printed, and of these 350 will be issued to the public, leaving 400 to be distributed by the Government The volumes will make their appearance now as rapidly as possible, as many are already in the hands of the printer.

— Congress is showing a commendable disposition to protect some of the great natural curiosities of the country against desecration or destruction. The Yellowstone Park, through the exertions of Dr. Hayden, was set aside forever as a public reserve. The project of preserving Niagara Falls by constituting the lands around them an international park has not yet been completed, but it is under consideration; and the House of Representatives passed, in January, a bill reserving from sale or other disposition the lands on which the "Big Trees" of California stand. The reservation is to be dedicated to the people, and set apart as a public park.

— According to an American journal, cabbage grew wild in Siberia; celery originated in Germany; the potato is a native of Peru; the onion originated in Egypt; tobacco is a native of South America; millet was first discovered in India; the nettle is a native of Europe; the citron is a native of Asia; oats originated in North Africa; rye came originally from Siberia; parsley was first discovered in Sardinia; the parsnip is a native of Arabia; the sunflower was brought from Peru; spinach was first cultivated in Arabia; the horse-chestnut is a native of Thibet; the quince came from the island of Crete; the pear is supposed to be of Egyptian origin; the horse-radish came from the South of Europe.

— The Annual Report of the Entomological Society of the Province of Ontario, Canada, for 1879, is quite fully illustrated,

and contains numerous articles on applied entomology, and a good deal of matter of general entomological interest.—In the Transactions of the California State Agricultural Society for 1879, appears an article entitled, The Rocky Mountain Locusts, their destructive power, how they eat, and breed, and bring ruin, by J. G. Lemmon; it contains a number of new facts regarding the native destructive California locusts, notably *Œdipoda atrox*, which was locally destructive in 1877, '78 and '79.

— One curious effect of the eclipse in California on Sunday, January 11, 1880, about the time of the greatest obscuration, was the bewilderment of the wild game on the bay. Flocks of ducks flew into the ferry slips, thoroughly disorganized. Another strange result was that, as the darkness increased, a valuable horse belonging to a gentleman at Alameda Point showed signs of great alarm which developed into madness as the gloom increased; he bit and kicked at all who came near, rushed through a fence and the side of a barn, and had to be shot.—*San Francisco Call.*

— By the recent death of Snellen Van Vollenhoven, Holland has lost its most distinguished entomologist. Kiesenwetter, well known as a coleopterist, has also died. We failed to record the death of W. P. Schimper, March 20th. He was distinguished as a botanist and palæontologist, holding at the time of his death the professorship of geology and mineralogy in the University of Strasburg. John Carey, well known to American botanists, died near London, March 26, and W. E. Austin died in Closter, N. J., March 18, aged 49. His specialty was mosses, and he had in preparation a manual of N. A. Hepatic mosses.

— A work by Keyserling on the spiders of North and South America is announced to be published in Nürnberg. It is a pity that a work of this sort should not be prepared by an American, who can study the spiders alive, become familiar with their young stages and with the variation of the species. A set of alcoholic specimens picked up here and there by mere collectors is apt to lead to the multiplication of "species," and to long synonymical lists. The work announced treats of the laterigrade spiders, will have eight partly colored plates and will cost 40 marks.

— Dr. August Weismann's studies in the Theory of Descent, with a prefatory notice by Charles Darwin, translated and edited, with notes, by Raphael Meldola, will be published by Messrs. Sampson, Low, etc., in three parts. The first will be on the Seasonal Dimorphism of Butterflies. Part II on the Origin of the Markings of Caterpillars and on Phyletic Parallelism in Metamorphic Species, and Part III on the transformation of the "Mexican" Axolotl into Amblystoma and on the Mechanical Conception of Nature.

— Mr. Julius Bien announces that he will publish a new Geological Map of the United States, by Prof. C. H. Hitchcock, provided a sufficient number of subscribers can be obtained to cover the expense. The base is the United States Centennial Map, revised and completed by order of Congress. It is 8x13 feet, and will be furnished with the geological colors, mounted on rollers, at $50, or in 16 sheets at $45 per copy. Explanatory text will accompany the map.

— The death of the distinguished geologist and mineralogist, Professor Karl von Seebach, is announced as having taken place on the 21st ult., at Göttingen, in the university of which town he held a chair. He was born at Weimar, in 1829, and has therefore died in the prime of life. The author of numerous works on geology and mineralogy, it is chiefly by his investigations into the causes of volcanoes and earthquakes that Seebach will be remembered.

— In the *Comptes Rendus* for February 9th, M. Pasteur describes the virulent maladies of fowls. He states that the cholera of fowls may be prevented from becoming fatal by inoculation. M. Pasteur suggests that we should seek the destruction of phylloxera by inoculation of the vine with some microscopic fungus, and he invites the attention of naturalists and others interested in the cultivation of the vine to the subject.—*English Mechanic.*

— The Chicago *Field* is publishing a series of articles by Mr. W. H. Ballou, on the bibliography of American naturalists; it begins with a list of the writings of Prof. A. S. Packard, Jr., and Dr. Elliott Coues, and will include similar bibliographical lists of other naturalists. Should it result in a bibliographical manual of American zoölogists, the undertaking will prove of very considerable advantage to students.

— A good deal of new light has been lately thrown on the nature of the Indian poison, curare. The plants which yield it all belong to the genus *Strychnos.* M. Planchon distinguishes four regions as centres of preparation of curare, for each of which a principal plant may be indicated. These are English Guiana, the region of the Upper Amazon, the region of the Rio Negro, and Upper French Guiana.

— The season of summer schools of Science has come. The Chesapeake Zoölogical Laboratory, directed by Prof. W. K. Brooks, under the auspices of the Johns Hopkins University, began its third session, at Beaufort, N. C., April 22d, and will remain open until September 1st. The laboratory will accommodate six persons, and will be equipped with boats, nets, dredges, aquaria, microscopes, &c. Application for admission may be made to Prof. W. K. Brooks, Beaufort, N. C.

— The fifth session of the Summer School of Biology of the

Peabody Academy, at Salem, Mass., will be opened July 6th, under the direction of Prof. E. S. Morse, aided by Profs. G. L. Goodale, H. G. Straight, Dr. C. S. Minot, and Mr. John Robinson, John Sears and Charles Fish. The course is solely for teachers, and will be elementary in its character.

— A new Summer School of Biology. Professors Shepard and Ford announce their intention of establishing a Summer School of Biology at Drury College, Springfield, Mo., beginning July 1st, and continuing at least six weeks. Prof. Shepard studied for a time under Prof. Packard, while Prof. Ford was a student of Prof. Peck, the N. Y. State botanist.

— At the meeting of the Sixth Congress of Russian Naturalists, Prof. Andreieff spoke of the necessity of giving instruction in natural sciences in primary schools; and M. Gerd gave an address on the impulse which could be given to the study of nature in Russia, its flora and fauna, by the teachers of the primary schools.

— The Michigan State Pomological Society has, at the suggestion of Prof. A. J. Cook, offered two prizes, the first of fifty dollars, and the second of twenty-five, to be given to the neighborhood that shows most skill, thoroughness and secures best results in destroying the coddling moth.

— The Japanese Government are about to establish a Geological Staff, to whose care will be committed a geological survey of the whole of Japan, founded upon the plan of the Geological Survey of the United Kingdom.

— The second edition of V. Rattan's popular Botany of California has been recently published by A. L. Bancroft & Co., San Francisco.

— Mr. Charles C. Frost, the noted shoemaker botanist of Brattleboro, Vt., died last week aged seventy-five years.

— Prof. Thomas Bell, the well-known English naturalist, lately died aged eighty-seven.

— The following errata occur in the March number: p. 161, line four and ten, for *opademe* read *apodeme;* line eleven for *samite* read *somite.* In the April number, p. 247, line 11, and in explanation of Fig. 14, for moth, *read* butterfly.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

NATIONAL ACADEMY OF SCIENCES, Washington, D. C., April 20, 1880.—The following papers were read: 1. Binocular Vision; Laws of Ocular Motion, by Joseph LeConte; 2. Hollow Water-Spouts and Sand-Spouts, by W. Ferrel; 3. On the Structure

of the Vertebrata of the Permian Period, by E. D. Cope; 4. On the Perforations of the Squamosal Bone of the Mammalia, by E. D. Cope; 5. Contributions to Meteorology, by Elias Loomis; 6. On the Structure of the Brain of *Limulus polyphemus*, by A. S. Packard, Jr.; 7. On an Instrument for Measuring Radiant Heat, by S. P. Langley; 8. On the Composition of Colors, by S. P. Langley; 9. The Sea Urchins of the *Challenger* Expedition, by Alexander Agassiz; 10. Size of the Brain in Extinct Animals, by O. C. Marsh; 11. On New Complex Inorganic Acids, by W. Gibbs; 12. On the Taconic System in Geology, by T. Sterry Hunt; 13. On the Telegraphic Determinations of Longitude by the U. S. Hydrographic Office, by Capt. F. M. Green, U. S. N.; 14. On the Announcement of the Discoveries of Intra-mercurial Planets by Telegraph, by D. P. Todd; 15. On the Nebula of Orion, by Prof. E. S. Holden; 16. On the Distribution of the *Zenopsis conchifera*, by Theo. N. Gill; 17. Revision of the Atomic Weight of Antimony, by Josiah P. Cooke; 18. On an Early Race of Man in Japan, by Edw. S. Morse; 19. Revision of Atomic Weight of Antimony, by Josiah P. Cooke; 20. Cloudbursts, by Wm. Ferrel; 21. On the effect of railroad trains in transmiting vibrations through the ground as regards its effects on observations in fixed observatories, by H. M. Paul; 22. On the modifications suffered by Light on passing through a very narrow slit, by Lieut. Albert A. Michelson; 23. Some remarks on the supposed nature of the Sun's Corona; and also, on a supposed new Meteoric Silicate, by J. Lawrence Smith; 24. On some modern developments bearing upon the Nebular Hypothesis and other matters connected therewith, as well as on some previous changes, and miscellaneous notices, by Stephen Alexander. The attendance was full. A eulogy of the late Prof. Henry, by Prof. Newcomb, was read by Dr. Coues. Prof. W. H. Brewer and Major J. W. Powell were elected members.

New York Academy of Sciences, March 15.—Prof. Thomas Egleston spoke concerning the iron and coal resources of Virginia.

March 29.—Mr. J. M. Batchelder noticed the influence of electricity upon the growth of plants, and the Algæ of New York harbor were remarked upon by Mr. B. B. Chamberlin.

April 19.—Mr. I. C. Russell gave an account of recent observations on the geology of Hudson county, N. J. Dr. J. S. Newberry remarked on the vegetation of the vicinity of New York in the Triassic age. Mr. B. Hitchcock read a paper on the physics of vision with the compound microscope.

May 3.—Prof. G. Macloskie made a communication on the structure of the vertebrate skull.

Boston Society of Natural History. April 7.—Mr. S. H. Scudder described the Devonian insects and their relation to the

doctrine of descent. Mr. W. O. Crosby remarked on the age and succession of the crystalline rocks of Guiana and Brazil.

April 21.—Mr. W. O. Crosby concluded his remarks on the age and succession of the crystalline rocks of Guiana and Brazil. Mr. E. Burgess read a paper on the structure of the mouth-organs of Butterflies, and some other points in their anatomy.

May 5.—Annual meeting for the election of officers and for the presentation of the reports of the custodian, secretary, etc. Mr. S. H. Scudder was elected president. Dr. B. J. Jeffries remarked on the present position of the question of the development of the color-sense.

AMERICAN GEOGRAPHICAL SOCIETY, NEW YORK, April 26.—A paper on Japan as it is, was read by Rev. Edward W. Lyle.

CALIFORNIA ACADEMY OF SCIENCES, April 5.—Mr. B. B. Redding exhibited a very artistically constructed fishing fly, manufactured and used by the Indians. The Indians, he said, will beat us in fishing. By the same gentleman, twigs of the *Larrea mexicana*, with the lac insect imbedded, were shown. These he had procured from Arizona since Prof. Silliman read a paper on the subject. He expressed a doubt about there being a sufficient quantity to make the extraction of the shellac and lac-dye a profitable industry, though the process is very simple.

[NOTE.—We have just received a paper on this lac from Mr. R. E. C. Stearns, for early publication.—*Editors.*]

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SELECTED ARTICLES IN SCIENTIFIC SERIALS.

AMERICAN JOURNAL OF SCIENCE AND ARTS.—May. Outlet of Lake Bonneville, by G. K. Gilbert. Chemical and geological relations of the atmosphere, by T. Sterry Hunt. Archæan rocks of Wasatch mountains, by A. Geikie. The sternum in Dinosaurian reptiles, by O. C. Marsh.

PSYCHE.—March. Contains a valuable résumé of advances in the anatomy of insects during 1878 and 1879, by E. Burgess.

THE GEOLOGICAL MAGAZINE.—April. Note on the geographical distribution of volcanoes, by. J. Milne.

NATURE.—April. Mr. H. N. Moseley is publishing in *Nature*, for this month, a valuable lecture on deep sea dredging and life in the deep sea.

QUARTERLY JOURNAL OF MICROSCOPICAL SCIENCE.—April. The coffee leaf disease of Ceylon, by W. T. Thiselton Dyer. Development of the kidney in its relation to the Wolffian body in the chick, by A. Sedgwick. Notes on the development of Araneina, by F. M. Balfour. Some teachings of development, by E. Schäfer. On the histology of Hydra, by T. J. Packer. The Orthonectida, a new class of the phylum of worms, by A. Giard.